SCIENCE

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THE LANE MEDICAL LIBRARY OF STANFORD UNIVERSITY[1]

WE have met to-day to mark a milestone in the history of Stanford University, on the one hand, and in the history of medical education, on the other. It is a milestone that we mark, not an epoch, for epoch-making events do not often appear more than once in a lifetime. But a milestone marks progress, even though after it is set up all shall go on as before.

Stanford University is now twenty-one years old. Its days were opened on a hopeful morning of October in California where all days are hopeful, just twenty-one years ago. It has come of age. It is old enough to be doing the work of a grown university.

And there is no work of the university more worthy or more needed than medical instruction and medical research, the training of men who shall help their fellows in all their bodily ills, on the basis of the best and fullest knowledge, while themselves adding day by day to the world's stock of wisdom. In these days medical research stands on the firing line of the advance of science. There is no branch of knowledge which is moving more rapidly and there is none which contributes equally to the aggregate of human welfare.

We dedicate to-day the home of the Lane Memorial Library of Stanford University to medical practise and medical research. It is the gift of the will of Mrs. Levi Cooper Lane. It begins its existence with a handsome building, adequate for its needs for years to come. When it must be extended we hope that the grateful people of San

[1] Address by David Starr Jordan at the dedication, November 3, 1912.

Francisco will be here to see that all its needs are met.

It has already on this initial day a library of nearly 40,000 volumes, all relating to medical practise and medical research, a good number of books, as you will see when you compare it with other libraries devoted elsewhere to the same subject.

The importance to San Francisco of such a collection of medical books kept up-to-date by a steady inflow of the best journals and monographs is obvious. The library is the natural center for creative effort and hence for all research, since there is no loss of energy so needless as is the doing again that which has been well done before. All new work must be based upon knowledge that has gone before. The breath of life of all research is the joy of seeking for the unknown. Chance discoveries of great moment in medicine are no longer to be made at random. Piece by piece must new truths be found and correlated. Each investigator must rest his work upon that of others. He must stand on the shoulders of the past if he is to look into the future. To know what has gone before is only possible where accumulated records are at hand. In the library which we dedicate to-day is massed the product of thousands of minds, some great and far-seeing, some small but earnest, but all seeking after truth. The great function of such a library as this is to accumulate and classify and make ready of access the knowledge that the world has already gained and to keep abreast with the steady current of advancing medical science, choosing from it all that seems likely to be worth while. Such a function is a difficult and responsible one and one that will be performed in fuller and fuller measure by this library as it meets more and more with the support of the great state in which it is located. Indeed its interest should extend far beyond the confines of any one city or state, for no such collection of medical books is to be found elsewhere on this continent west of the Mississippi nor along the shores of our great ocean so soon to be expanded by the Panama Canal; itself a product of human skill that has been made possible by the advance of the science of medicine.

The Stanford Medical Department with its medical building, including Lane Hall, its Lane Hospital and its Lane Library, are, as you have already heard from my colleague, Dr. Rixford, the gift of the eminent surgeon, Levi Cooper Lane and of the faculty of Cooper Medical College. Dr. Lane first established the Cooper Medical College, named by him for his uncle Dr. Elias Cooper. But as the future of medical instruction must lie with the universities, and as sound medical instruction must rest on university courses in physiology, chemistry, biology and physics, Dr. Lane made arrangements whereby the board of directors of Cooper Medical College were able to deed this property to Stanford University on the sole condition that the university should use the gift of money and buildings for medical instruction. The corporation of the Cooper Medical College has dissolved itself, patriotically turning over its good-will and all its properties, hopes and achievements to the larger institution, and Stanford University has loyally accepted the trust and is doing the best work it knows how to do in the line of the acceptance of these pledges.

The function of the privately endowed university, as the authorities of Stanford understand it, is to set standards in education and to uphold these standards. It must set standards in service to society as well as within its own classrooms.

In whatever way a school of medicine can help the people it is its duty to render aid. The hospital is the laboratory of clin-

ical medicine. This has become an axiom in modern medical instruction. But a further duty is incumbent on the university hospital of to-day. It should be so conducted and controlled as to serve as a model for all that is essential and worthy in the institutional care of the sick. Only in such a hospital with its numerous internes and assistants and its trained staff can satisfactory control be made of new methods of treatment and such treatments standardized for use of others. The elevation of nursing standards, the thoroughness of case study and care that inevitably follow the well-trained student into the hospital and ward are the great boon of a university hospital. All this involves an effort at the best in research, in training, and in character building.

The funds of a private institution are limited. It can call on no legislature for help if it has undertaken more than it can carry out. It must be sufficient unto itself. This means limitation. It can never cover the whole range of knowledge, nor the whole range of practical achievement. It can not make its campus coextensive with the state. It can not provide for multitudes of students, dependent on fees, unless it makes these fees so high as to be prohibitive to self-helping men and women. To this class belongs the vast majority of the students we in the west find worth while.

But the private institution has its own advantages. It has freedom of development. It is dependent on no outside influence for its direction. It can undertake what it deems best worth doing. It can insist on the highest standards. It is above all temptation to grant university titles or degrees to the products of four years of frivolity, dissipation and sham. Above all, it has the privilege as well as the duty of making its professional courses of such a character that it can be sure that every graduate is really a university man. It is not claimed that the private university has any monopoly of high standards or of efficient practise. It claims only that no other type of institution has the right to loftier ideals. In proportion as it is true to its opportunity its aims should be the highest within its range of possibilities.

No institution can do better than its best. If it falls short of this, it has no adequate reason for being. And Stanford University means to justify herself. She is pledged to justify herself in the direction of medical instruction. And after all, in the multiplicity of medical schools instruction in medicine is nowhere overdone. The profession of physician is overcrowded because its men are undertrained. It is a very true expression that there is always "room at the top." In medicine as elsewhere in life the crowd is around the bottom of the ladder.

A young medical student in New York, it is said, committed suicide not long ago, leaving behind him his word: "I die because there is room for no more doctors." Room for no more doctors just now when in the history of the world it is most worth while to be a doctor! Now when the progress of the sciences and arts which deal with sickness and health have given the intelligent and honest doctor a power no one else has ever had before over the forces of sin and death!

Another medical student was asked how he dared to return to take so much time to prepare for a profession already so overcrowded. "I propose to practise medicine," he said, "those in the crowd must look out for themselves."

Frederick Denison Maurice once said: "Make your system of education such that a great man may be formed by it, and there

will be manhood in your little men of which you do not dream."

And to such a system of instruction in medicine, a system which may form great men if great men come within its reach, this beautiful library is dedicated. And all resources of Stanford University stand pledged to make this purpose good.

I said just now that medical research is now on the firing line of the advance of science. It has left behind it as outworn garments all medical theories, and all schools of medicine. The medical advance is the work of no school, the offspring of no preconceived theory.

One of my early students, on graduating in medicine, was asked to what school he belonged. His answer was "I have nothing to do with schools. I am trying to practise medicine." Just as soon as men seriously try to practise medicine, schools of medicine cease to exist. These belong to the metaphysics of the dark ages, when men, in default of science, tried to practise philosophy.

At the most or at the best, a school indicates merely a preference for one mode of therapeutics over another, or over all others, a matter of very minor importance as compared with knowing the nature of the ailment in question and of causes which brought it about. Accuracy of scientific knowledge is fatal to the prearranged theory of treatment of disease, the basis of any school of theoretical medicine. Accuracy of knowledge goes beyond symptoms or surface indications. It is with symptoms and symptoms only, in default of knowledge, that varying schools of medical therapeutics become possible. When we know the actual conditions which give rise to symptoms, all methods must rest on these conditions.

All art is based on science. Science is human experience tested and set in order. Art is knowledge in action. An art which is not based on knowledge becomes a mystery or a trade. The practise of medicine through the ages has been one or the other or both. It is a trade when the physician apprentice follows his master about, learns his ways, his prescriptions and his professional dignity. It is a mystery when practise is based on some theory of therapeutics which goes outside of human experience for its justification.

Science is alike to all men who have grasped its data and its conclusions. Art will vary with the personality of the individuals who practise it. Sound medicine must rest on science. Whoever treats the ills of the human body successfully must know this body in health and in disease. He must know the range of its disorders, its abuses, its dislocations and its parasites. Those who try to heal without knowledge of the actual conditions with which they deal are of necessity impostors.

The limit of "medical freedom" is a very plain and natural one. Let the patient take whatever kind of treatment he may wish, but let no treatment be administered by persons who have no knowledge of the fundamental facts of medical science. If the requirement of technical knowledge is fatal to any school of therapeutics, it is time that that particular form of robbery should be done away with. Taking chances with the lives of others for the money there is in it is not a profession to be encouraged.

The basis of the varying schools of medicine lies not in science, but in the varying theories of symptoms. In the old days, when microorganisms were unknown, where physiology was elemental and pharmacology itself a form of metaphysics, it is not strange that symptoms engrossed the attention of the practitioner and that there

grew up widely differing theories in regard to their treatment.

It was natural in these days, that men should face symptoms with remedies calculated to remove or obscure them. This method, contemptuously designated as allopathy, "unlike treatment," as the drug and symptom were unlike, had in it the germ of better things, because it gave play for experiment and was not bound hand and foot by any predetermined notion.

It was a step forward from the idea of the dark ages, that each disease had some definite predestined remedy, that for each ailment, that is, a special group of symptoms, there was somewhere, somehow, some cure mysteriously provided in nature if we could only find it out.

As the plant world lies all about us, as most plants secrete or produce something with a definite odor or taste, balms, resins, aromatic oils, bitter alkaloids, strange substances useless for any purpose unless it be that of medication, it was natural that men should turn their attention to these substances. Some of these products or simples showed strange effectivenesses. Others did no harm and were therefore suspected of doing good. Quinine was thought to cure malaria by setting up a feverish condition like that arising from malaria itself. Digitalis controlled the action of the heart. Mandrake, senna, rhubarb kept the intestines open. The pink (*Spigelia*) was death to worms. Yerba buena, yerba santa, sage tea, catnip tea, tansy tea, sassafras tea, as well as tar, molasses and sulphur, were "good for the blood," especially in the spring, and the tonic effect of almost any bitter bark dissolved in alcohol was highly appreciated.

Out of this notion that a specific disease had a specific cure, naturally arose the form of quackery involved in the patent medicine. Its practical value lay in the elimination of the doctor, or rather in postponing his arrival until near the end. It is very simple, by reading an advertisement in any easy-going newspaper, or by the perusal of an almanac, to pick out your own disease from the list of symptoms graphically set forth. Almost every one has felt headaches, twinges, blurrings, ringings, smartings, achings, givings and misgivings and these will indicate the necessary drug. If this drug be essentially whisky and water made sweet or bitter by some easy stain, or if some more virulent or effective poison is used, there is likely to be enough of apparent satisfaction or of change in symptoms to justify a written testimonial and another bottle of the drug.

Or if the basal constituent of the medicine be merely water, the effect of hope with the lack of visible harm is likely to lead to the same results. In either case, the self-medication is likely to produce no effect or an effect worse than nothing.

While much that is now sold in the drug stores represents merely a harmless or sometimes useful physician's prescription, the aggregate result of the patent medicine is the building up of gigantic systems of robbery, on the one hand, and a corresponding damage to public health, on the other.

The way out of the patent medicine domination lies in the better training of physicians, on the one hand, and the enlightenment of public opinion, on the other. No more effective agency exists for the forming of public opinion than an aggressive administration of the Bureau at Washington which deals with pure food and pure drugs. No single agency in this direction has counted for so much as the personal work of one man, who has spent his life in fighting frauds and poisons. But we must have a hundred Wileys in the public service where we now haven't one.

Among the host of specifics men naturally sought for some guiding rule, some informing spirit that would tell them beforehand and once for all how to match these diseases with the predestined healing agent.

Sometimes this was found in the looks of the plant. Its flowers or leaves or roots somehow simulated the disease it was found to cure. Thus the figwort was denominated *Scrophularia,* apparently for its scrofulous appearance. The liver-shaped leaves of *Hepatica,* the liverwort, showed clearly what was expected of it. And in the ignorance of what was really the matter and of what really happened after a remedy was absorbed, there were as many successes as failures, and the dark mysteries of the profession prevented any following up of either.

A more scientific application of the method of resemblances lay in the study of the effects produced by a drug in relation to the symptoms of the malady it was to cure. Like symptoms, like effects. Like cures like. If your patient is troubled with colic, give him a colic-producing drug. If with eczema give him something to make the skin smart. The same principle would hold for all diseases.

But with this went the saving clause of homœopathy or like treatment. Don't give too much, and give good nursing. As time, patience and good nursing are the best of drugs, this method has had a large vogue as well as a large effectiveness. If it is based on a sound study of the human body, its defects, its slips and its parasites, this method must merge into the real practise of medicine.

For knowing the distemper, its causes and its range, the method of treatment is a minor matter. The idea that a disease has a definite drug as its remedy, whether in large quantities or small, is a relic of the middle ages. Drugs do not heal anything. Some are palliative, resting in the category of vaseline, cold cream or talcum powder, some kill parasites directly as quinine kills the animal organisms known as malaria. Sulphur is death to the itch, the visible cause of the distemper once thought almost incurable, and known as the "gall struck inwards." Others do evil as stimulants or counter-irritants, that good may come, helping on the one hand through the incidental damage on the other.

But the metaphysical relation of drug to symptom has no existence and has passed out of medical practise never to return.

With doubts of the efficiency of drugs as remedies came theories of therapeutics by which all drugs were discarded. Orthopathy in its day rejected them all, relying on the well-known disposition of nature to heal her wounds whenever she is let alone. Hydropathy set people to sweating under close envelopes of wet sheets, often, it is true, to their great advantage. I can remember when the wet sheet packing and the over soul were the test and signal of a progressive nature, much as to-day are the referendum and recall.

Mind-healing in various forms has always found its place. It is a notorious fact that when the symptoms of any disease are graphically set forth, the average reader finds most of these symptoms in himself. It is only a step to the conclusion that these symptoms are the cause of the disease. If you can create the impression that the symptoms do not exist you take away the disease. For disease and symptoms are alike the product of morbidity of mind. To have faith is to cure this morbidity. One of the leaders in this form of therapeutics says:

> Sin, Sorrow and Sickness are all three illusions of the Sinful Soul. . . . They are but troubled

dreams of the darkened soul. . . . In afflictions of disease and dread and death one must say "This is a dream." Then it becomes a dream and we rise above it into an atmosphere of perfect serenity. . . . We need not deal with the body, for the body does not exist. It is dull, heavy and aching because it is the dead Residuum of Dream. When we forget it, it is no longer there. Treat a belief in sickness as you would sin, with sudden dismissal.

It is undoubtedly true that a serene spirit is a valuable agency in the recovery from disease. It is likewise true that suggestion has a mighty potency when it is rightly applied. It is a legitimate and recognized branch of therapeutics, which may be destined to have a wide application in the future treatment of disorders of the nervous system.

But it is likewise true that suggestion heals no broken bones, a spirit unperturbed gives no safeguard against poisoned mosquitoes and the power of the will and the imagination is potent chiefly against disorders of the imagination and the will.

The first and most important thing in any treatment is to find out what is the matter and then, if may be, to remove the cause from which the symptoms flow. No system of philosophy, no cult of religion, gives us any help as to matters of fact. It does not strengthen our knowledge of the demands of the body to deny the body's existence. The whole fabric of modern science, the whole fabric of modern civilization, is based on the conception of the reality of external things. The sanity of life is conditioned on our belief in realities, the mental state produced by contact with external things as distinct from illusions, those mental states arising from conditions within ourselves. This distinction is the foundation of safety in life. Our body through its nervous system is cognizant of realities. The defects in this nervous system may cloud our view with illusions. The art of sound living is to discriminate between the two sets of impressions. To confuse reality and illusion is to confuse life and death. To show that perception and reason may sometimes be deceived is not to add reality to the figments of imagination. It does not advance science to doubt the things we know to be true in order to give proof to propositions we know to be false.

We may be therefore certain that progressive medicine will still believe in the reality of the human body and the rational veracity of the world of sense.

We may be sure that medical science does not grow in accordance with the theories of any school of medicine or of metaphysics. It is advanced by the study of things as they are, by the use of tools of precision on definite problems, by the microscope and scalpel, the test tube and reagent, by the culture of germs and the discovery of germ-killers. It grows by probing the actual causes of bodily disturbances and the actual removal of such causes.

It grows as all sciences have grown by the method of induction, by putting two and two together and verifying the apparent existence of four as a resultant.

And in the future of medicine, the mere removal of disease must play more and more a subordinate part. Most disease can be prevented. Above all therapeutics stands sanitation. It is possible to remove causes of disease long before any disease begins. It is possible to heal our patients before they are ever sick. Our knowledge in many fields is now adequate for this result. No one can be attacked by an infectious disease unless we have somehow or other permitted the infection.

In modern war, it now costs on the average about $15,000 to kill a man. In the late Boer War, this expense ran up to nearly $40,000. It is cheaper to save

men. It is cheaper to stop killing. In our own country, in the time of peace, when nothing but peace is possible among civilized nations we spend nearly a million dollars a day on matters concerned with past or future wars; $850,000 a day, on future wars alone, that we may not be caught napping when the day of the impossible shall arrive.

A wiser and more civilized nation would give some part of this sum to the prevention or stamping out of the worst of infectious diseases. For if we are napping these are sure to come. The danger of the red plague, present everywhere, is infinitely greater than that of war with any part of Europe or of Asia. The terrible infliction of the unknown parasite which shows itself as infantile paralysis awaits the strong arm of the people to set it aside entirely. No infectious disease would long exist if we made adequate quarantine provision. Its germs, animal or plant, must be carried from man to man, or from animal to man, else the race of parasites would die out. Now that we know what our enemies are, it is possible for us to fight them. This I said in a review of Tyndall's work which I printed thirty-five years ago. Now that we know what our enemies are and now that we know that they can be fought successfully only by national and international cooperation, it is our duty thus to fight them. It shows a lack of national manliness to continue to bear these ills when a little energy with the knowledge we have is adequate to throw them all off.

I am still a young man, I am sure of that. As I said once before, when I hear the students speak of Old Jordan, I know that they mean the river of Palestine, or perchance in these days a forbidden brand of alcoholics. They do not mean me.

It is not so many years since I received the degree of doctor of medicine, and I hasten to say that I have never practised medicine and never intended to, so that my failures in knowledge have never harmed any one, nor brought me a dollar of unearned increment.

But at that time in 1875, the words bacterium, bacillus, microbe were all unknown, all slumbering together in the Greek Lexicon. This lexicon gave no suspicion that *βακτερίον* and *λογός* would come together to form a science, and that the one science most vitally related to human life. The world of science and therefore the province of medicine knew nothing of invisible one-celled animals and plants, bacteria and protozoa, which flourish and run their courses in the life blood of living animals. The source of infection in disease was then called a virus and the growth of a virus was an extension of death. Carlyle had said that a fallen leaf must still have life in it else how could it rot. But neither the poet nor the prophet realized that this life which tore the fallen leaf to pieces was the life of a multifarious group of one-celled vegetation whose function it is to return all organic matter not still active back to the universe in its constituent elements. In those days malaria was an evil spirit or miasma, the product of bad air or may be of bad water. All plagues were of the same sort. No one suspected the mosquito, the fly, the flea, the louse, the bedbug or the woodtick of harboring any vices worse than those which their bite or their presence suggests.

There was no science of infectious diseases and therefore no art in curing or preventing them. The most that could be done was to let them run their course, allaying as may be some of their most annoying symptoms.

Antiseptics were only guesswork. We had not heard of carbolic acid, or barely

heard of it, and the coal-tar products with their varied possibilities of usefulness and mischief still lay in the fossil beds of the earth. Surgery was a matter of luck, a gamble, as the phrase is, still conducted, as has been said, "along the lines laid down by the early Egyptians." There had been no Lister to show the reason for clean knives, clean hands and clean air, and the battlefields of those days were a wild riot of the germs of gangrene and blood poisoning.

As surgery did not exist, we knew nothing of preventive surgery or the surgery of pathology.

As medicine dealt with symptoms, we knew nothing of pharmacology. These were the days before Michael Foster and physiology was still merely a series of deductions from the facts of elementary anatomy. The nature and structure of the body cell was very scantily known. Without knowing the germ cell, the physical basis of heredity, the science of heredity was unknown, and without accurate knowledge of heredity, the science of eugenics can have no existence or meaning.

At the present time, the facts and laws of pathology are to the trained physician as essential as the alphabet or the multiplication table to the rest of the world. But we poor practical doctors of our day had to get along without it. Science had not reached so far, and we had to be practical men because, perforce, we could not be scientific. Dr. Charles Sedgwick Minot has well pointed out the distinction. He says:

> The only important difference between the practical doctor and the scientific doctor is that the patients of the practical doctor are more likely to die.

In healing men, as in other lines of industry, the first requisite is to know how. To know how is the essence of science.

The next stage of the scientific doctor is not merely to cure his patients, but to help conduct the affairs of the community so that men and women will no longer come to him as patients to be cured.

Half the disease of the world comes from the infection of the crowd. Nine tenths of the infection of the crowd could be spared if the knowledge we have could work itself out in governmental action.

The governments of the world are about the poorest tools we know of for the achievement of good deeds. They are controlled by tradition, by prejudice, by the noise of the drum and fife. They are ruled by influence of caste and privilege. They are bigoted and wasteful and when they deal with the individual life they are likely to be careless and unjust.

But in dealing with the great plagues of the world, the black, the yellow, the red and all the poisonous array of health-breaking parasites, the government is the only tool we have. The individual is helpless, the community is all. The acts of the community can not rise much above its knowledge. All effective government is by public opinion. The people must learn the facts of pathology and of sanitation. There is no school of medicine which can honorably come between them and the truth.

And that the Lane Library of Stanford University, the Medical Department of Stanford University and the university itself, may do their part in the great work of bringing health to the people, and that they may cooperate with the sister schools and with all other good agencies to good ends, is the motive behind the functions of to-day.

ANTRITTSVORLESUNG[1]

Eure Kaiserliche und Königliche Majestäten!
Hochansehnliche Versammlung!

DER erhabene Wunsch Eurer Majestät,

[1] Am 31. Oktober in der neuen Aula der Universität zu Berlin gehalten.

einen regeren Verkehr zwischen Deutschland und Amerika zustande zu bringen, hat zu dem Professoren-Austausch geführt, der sich als ein wirksames Mittel zur Beförderung der Wissenschaft und zur Annäherung der beiden Völker erwiesen hat. Wie er geschätzt wird, können wir daran erkennen, dass der Austausch der Professoren sich ausdehnt und schon mehrere Länder in engere Beziehungen zueinander bringt. Wir erkennen dankbar an, dass der geniale Gedanke Eurer Majestät schon eine welthistorische Bedeutung gewonnen hat.

Seiner Exzellenz dem Herrn Kultusminister und Seiner Magnifizenz dem Herrn Rektor der Friedrich-Wilhelms-Universität überbringe ich als der diesjährige Vertreter von Harvard die Grüsse der ältesten Universität der Vereinigten Staaten an die grösste und grossartigste Universität der Welt—möge sie gedeihen und ihre hervorragende Bedeutung durch alle Zukunft behalten. Die Kultur eines Landes lässt sich am besten an seinen Universitäten ermessen. Die weitsehenden Ratgeber, die zur Begründung der Königlichen Friedrich-Wilhelms-Universität beitrugen, erkannten schon die Universität als die Hauptquelle der Kraft und der Bildung des Volkes.

Dem tieferen Sinne des von Allerhöchster Seite ausgesprochenen Wunsches zugunsten des Professoren-Austausches hoffe ich dadurch zu entsprechen, dass ich mich als den Repräsentanten der amerikanischen Wissenschaft betrachte, dessen Hauptpflicht es ist, Sie mit unserer wissenschaftlichen Tätigkeit besser vertraut zu machen, und zwar nicht, weil die amerikanischen wissenschaftlichen Arbeiten an sich besser seien, sondern, weil sie verschieden sind und infolge der Schwierigkeiten des Verkehrs bei Ihnen bis jetzt nicht so bekannt geworden sind, wie sie es ihrem inhaltlichen Werte nach sicherlich verdienen. Aus diesen Gründen habe ich mich entschlossen, dem mir von hiesigen Kollegen erteilten Rate Folge zu leisten, indem ich meine Hauptvorlesungen der Schilderung der von meinen amerikanischen Fachgenossen in den letzten Jahren gemachten Entdeckungen widmen will. Die betreffenden Entdeckungen aber sind viel zu zahlreich, als dass ich alle werde berücksichtigen können.

Wir werden also bei der erwähnten Hauptvorlesung mit den Ergebnissen der amerikanischen Forschung im Gebiete der Anatomie und Entwicklungsgeschichte zu tun haben. Die in Betracht kommenden Entdeckungen sind zum Teil von fundamentaler Bedeutung.

Ein Beispiel: Wichtig ist der Begriff der Cytomorphose, das Grundgesetz der Umwandlung der Zellen. Dieser Begriff ist in Amerika schon geläufig. Es gibt auch mehrere Untersuchungsfelder, die fast ausschliesslich von amerikanischen Forschern kultiviert worden sind. Hier sind folgende Gebiete zu erwähnen: die Entstehung des Geschlechtes, eine uralte Frage, deren Lösung uns jetzt endlich möglich erscheint;—die Entwicklung des lymphatischen Systems, womit das Grundproblem der Entstehung der organischen Struktur überhaupt eng verbunden ist;—ferner: die Beziehungen der Nerven zum Gehirn, die zu bestimmen es, unseren Neurologen durch mühevolle Analysen gelungen ist, wodurch eine unerwartete Vertiefung unserer Erkenntnis des Hirnbaues erreicht wurde. Ich möchte aber mehr leisten, als bloss die Resultate unserer wissenschaftlichen Tätigkeit meinen Zuhörern mitzuteilen; daher beabsichtige ich, im Laufe der Vorlesungen mit den rein wissenschaftlichen Darstellungen erstens Angaben über die Forscher, deren Leistungen berücksichtigt werden, und zweitens Beschreibungen der betreffenden Anstalten so zu verweben, dass

ein möglichst ausreichendes Gesamtbild erzeugt wird, woran man zugleich die Leistenden und das Geleistete wird erkennen und ermessen können.

Für die von mir an der Universität zu haltende öffentliche Vorlesung, die unter dem Titel "Der Mensch in seiner Stellung in der Natur" angekündigt ist, soll eine gemeinverständliche Darstellung gewählt werden. Der Mensch wird vom Standpunkte des Naturforschers aus betrachtet, das heisst, es werden die Vorgänge seiner Entwicklung und die Eigentümlichkeiten seines Baues mit Bezug auf die Anpassung an die Lebensbedingungen seiner Existenz behandelt. Wir wollen uns also nur gelegentlich mit der phylogenetischen Entstehung des Menschen und mit der Ethnographie beschäftigen. Durch die Betrachtung des reichen Materials von einem etwas ungewöhnlichen Standpunkte aus wird unser Interesse angeregt, und es wird auch die Konkurrenz mit anderen, verwandten Vorlesungen in vorteilhafter Weise vermieden.

Die gegenwärtige Gelegenheit eignet sich dazu, einige allgemein gehaltene Betrachtungen über die Lage der Naturforschung in Amerika Ihnen vorzulegen, damit sie einen klareren Begriff von dem jetzigen Zustande der Wissenschaft jenseits des Meeres sich bilden können. In der Geschichte der Wissenschaft bei uns lassen sich, wenigstens für unsere unmittelbaren Zwecke, drei Perioden unterscheiden: erstens die Periode der Colleges; zweitens die der Universitäten; drittens die der Forschungsanstalten.

Die erste Periode, die der Colleges, dauerte bis etwa 1870. Das College steht höher als das deutsche Gymnasium. Da es seinem englischen Vorbilde nachgemacht ist, so vermittelt es nur die allgemeine höhere Bildung und versucht gar nicht, Fachgelehrte zu erziehen. Unsere Colleges lassen sich mit den deutschen Universitäten direkt nicht vergleichen.

Selbstverständlich ging es in den amerikanischen Kolonien während des siebzehnten Jahrhunderts ziemlich kümmerlich zu, doch fingen die Kolonisten sehr bald an, sich mit dem höheren Unterricht zu beschäftigen. In Massachusetts fand die Ansiedlung 1620 statt. Sechzehn Jahre später erfolgte die Begründung von Harvard College. Seitdem sind die Colleges sehr zahlreich geworden und sind immer stark besucht worden. Daher ist es gekommen, dass Amerika eine sehr bedeutungsvolle, überall verbreitete Klasse von Gebildeten hat, die die Hauptrolle in unserem ganzen Leben spielt, weil sie die grosse Mehrzahl der Führer in allen Berufen liefert. Sie gewinnt stetig an Einfluss und Bedeutung. Aus ihr stammt die Hauptunterstützung aller höheren öffentlichen Bestrebungen, aus ihr stammt die Mehrzahl der wissenschaftlichen Stiftungen.

Die Colleges beschäftigen sich sehr wenig oder gar nicht mit der Erziehung von Forschern. Es fanden sich aber trotzdem, besonders im neunzehnten Jahrhundert, einzelne tüchtige Gelehrte, die sich meistens selbst ausbildeten. Ich erwähne nur Bancroft und Lowell, Dana und Hall, Rush und Dalton, Leidy und Wyman, Young und Asa Gray. Wie hat das sich geändert! Bald wird ihre Zahl der in Deutschland gleich sein und diese Forscher werden unter günstigen Verhältnissen arbeiten. Die Verbesserung begann mit dem Erscheinen von Louis Agassiz in Amerika, des deutsch geschulten schweizerischen Naturforschers. Agassiz war einer der genialsten Menschen des neunzehnten Jahrhunderts und wusste in Amerika schnell ein seitdem sich nicht nur erhaltendes, sondern auch immer vergrosserndes Interesse für die Naturforschung zu erwecken. Als er das "Museum der ver-

gleichenden Zoologie'' 1859 in Cambridge begründete, haben viele gemeint, er leide an Grössenwahn und sei ein Träumer; aber sein Traum hat sich verwirklicht, und das ''Agassiz-Museum'' ist nicht nur ein grosses von Weltbedeutung, sondern auch der Massstab für viele anderweitige amerikanische wissenschaftliche Institute geworden.

Unsere zweite Periode, die der Universitäten, begann in den siebziger Jahren des vorigen Jahrhunderts, als zwei hervorragende Führer zwei Universitäten, die sich als ebenbürtige und gleichwürdige den europäischen Universitäten an die Seite stellen lassen dürften, aufzubauen anfingen. Diese Führer waren der Präsident Eliot von der Harvard University in Cambridge-Boston und der Präsident Gilman von der Johns Hopkins University zu Baltimore. Ihre schwierige Aufgabe haben sie glänzend gelöst. Sie erreichten ihr Ziel dadurch, dass sie Post-graduate Schools gründeten und weiter entwickelten, die, etwa wie die deutschen Universitätsseminare, die Aufgabe haben, Studenten zu selbständigen wissenschaftlichen Arbeiten anzuleiten. Viele andere wirkliche Universitäten sind entstanden, obwohl sie bis jetzt untereinander sehr ungleich geblieben sind. Die weniger entwickelten betrachten sich mit Recht als Kinder, die mit den Jahren sicherlich erwachsen werden. Es wird voraussichtlich nur wenige Jahre dauern, bis wir in den Vereinigten Staaten über fünfzig gut entwickelte Universitäten haben werden. Ein Anfänger, der Naturforscher werden will, kann in Amerika die erforderliche Erziehung geniessen; doch möchte ich den jungen Forschern immer noch wenigstens einen Teil ihrer Studien in Deutschland zu machen anraten.

Die dritte Periode, die der Forschungsanstalten, hat keinen so bestimmten Anfang, weil die Anstalten zum Teil langsam entstanden sind; doch können wir sagen, dass diese Periode mit diesem Jahrhundert anfängt. Von den betreffenden Anstalten ist die Mehrzahl mit Universitäten verbunden—im letzten Jahrzehnt sind grosse Laboratorien überall entstanden, wovon mehrere nirgendwo übertroffen werden. Die Lehrer, die in denselben arbeiten, wissen, dass es unumgänglich ist, gute Untersuchungen durchzuführen, wenn sie auf ihrer akademischen Laufbahn vorwärtskommen wollen. Zu gleicher Zeit sind mehrere unabhängige Forschungsanstalten gestiftet worden. Ich erwähne die drei kolossalen Museen für Naturgeschichte zu New York, Pittsburgh und Chicago, das Rockefeller-Institut für medizinische Forschung, mehrere Stiftungen zur Untersuchung des Krebses, die zahlreichen von der Carnegie Institution zu Washington geleiteten Spezial-Laboratorien, das Wistar Institute zu Philadelphia, das Marine Biological Laboratory zu Woods Hole u. a. m. Wahrlich, an Gelegenheit und Mitteln fehlt es nicht!

Ausgezeichnete und glänzend dotierte Bibliotheken haben wir schon, und sie werden stetig reichhaltiger. Wir machen von denselben um so grosseren Gebrauch, als die Bücher sehr leicht und schnell zu bekommen sind.

Zwei sehr charakteristiche Eigenschaften der Amerikaner tragen wesentlich zur Förderung der Wissenschaft bei. Es handelt sich erstens um die Gewohnheit des gemeinschaftlichen Unternehmens und zweitens um die hoffnungsvolle Stimmung. Diese Eigenschaften verdanken wir unserer kolonialen Entwicklung.

Die Vereinigten Staaten sind aus dreizehn unabhängigen Kolonien entstanden. Die ersten Kolonisten fanden überall grenzenlose Urwälder. Da musste jeder für sich sorgen und selbst alles leisten, was

zu der Neuerzeugung der Zivilisation nötig war. Sogleich entwickelte sich ein starker Individualismus, der unter uns erhalten bleibt. Aber diese selbstbewussten Menschen waren grossen Gefahren ausgesetzt. Dadurch wurden sie häufig gezwungen, sich zur gemeinschaftlichen Verteidigung zu vereinigen. So entstand die Gewohnheit der freiwilligen Kooperation. Wir vererbten ein starkes Selbstgefühl und eine Neigung zum gemeinschaftlichen Zusammenwirken. Die Verschmelzung dieser scheinbar feindlichen Bestrebungen zu einer einheitlichen Macht ist das Hauptmerkmal der Amerikaner. In dieser Macht findet die Demokratie zugleich ihre Rechtfertigung und ihre Befriedigung. Dieselbe Macht hat die Wissenschaft gefördert; denn durch freiwillige Kooperation sind die vielen Fachzeitschriften fast ohne Ausnahme entstanden. Der Kooperation verdanken wir wichtige Unternehmungen und die schöne Bereitwilligkeit, gegenseitig sich bei schwierigen Untersuchungen zu unterstützen; der Kooperation verdanken wir die Bildung und das Gedeihen der zahlreichen Nationalen Fachgesellschaften, die alljährlich während der auf Weihnachten folgenden "Convocation Week" tagen. Diese Sitzungswoche haben wir durch Kooperation von den Universitäten abgewonnen.

Um die bei uns herrschende hoffnungsvolle Stimmung zu erklären, muss man den Hauptbeitrag berücksichtigen, den wir fast unbewusst zur Lösung des Problems der menschlichen Gesellschaft geliefert haben. Dieser Beitrag ist eine Entdeckung, die ja sehr einfach und naheliegend war und doch erst durch die in Amerika obwaltenden Verhältnisse sich unserem Erkenntnisvermögen offenbaren konnte. Wir haben durch Erfahrung entdeckt, dass die Mehrzahl der zu uns herüberkommenden Einwanderer ihre volle Leistungsfähigkeit nie entwickelt hatten, und zwar deshalb nicht, weil ihr Verstand weniger in Anwendung gekommen war, als er es hätte gut ertragen können. Der Taglöhner wird bei uns ein Gewerbearbeiter, der Gewerbearbeiter ein Geschäftsmann, und der Geschäftsmann erweist sich eines noch höheren Berufes fähig. Für den Staat sind diese unaufhörlich fortgehenden Umwandlungen von der grössten Bedeutung, denn durch dieselben wird eine Verschwendung der Menschen vermieden; denn es ist eine Verschwendung, wenn eine Nation den Vorrat an menschlichem Verstand nicht vollkommen ausnutzt. Ein Staatsmann darf nie vergessen, dass die Menschen der Hauptschatz des Staates sind. Wir können hier bei diesen Überlegungen nicht verweilen, und gehen daher unmittelbar zum Schlusse über; hauptsächlich durch das stetige Vorwärtskommen wird die allgemeine Stimmung hoffnungsvoll.

Der typische Amerikaner erträgt oft unangenehme Zustände mit einem Gleichmut, der einen Europäer ins Staunen versetzt, aber nur, weil der Amerikaner die sichere Überzeugung hegt, dass die Übelstände mit der Zeit überwunden werden. So geht es mit unseren wissenschaftlichen Anstalten: zuerst oft nur der bescheidene Anfang, dann die grossen Hoffnungen, endlich die Erfüllung.

Daraus folgt, dass die Einheitlichkeit bei uns gar nicht in den Universitäten und den wissenschaftlichen Instituten, sondern nur in den Gesichtspunkten, in der Gemütsstimmung und in dem Seelenzustande zu ersehen ist. Wir haben in den östlichen Teilen unseres Landes eine Anzahl von vorgeschrittenen Universitäten; im Westen kommen gute und auch weniger entwickelte Universitäten vor. Hier und da findet man nur geringe Anfänge. Die University of Minnesota verfügt auch jetzt

hoch über das nicht grosse Gebäude, womit sie anfing, und es leben noch Professoren, die an ihrer Gründung teilnahmen. Dieses Jahr aber hat die University das grösste und vollendetste anatomische Institut der Welt eröffnet. Es stehen da zwei Denkmäler:—der "Erwartung" und der "Erfüllung" gewidmet.

Vor vierzig Jahren entschloss sich ein zwanzigjähriger Amerikaner, sich der Wissenschaft zu widmen. Bald erkannte er, dass es damals in Amerika einem angehenden Naturforscher sehr an Gelegenheiten und Unterstützung fehlte, daher entschied er sich, nach Europa zu gehen. Er fand in Deutschland die heiss ersehnten Lehrer und Anstalten, und so kam es, dass er durch seine deutsche wissenschaftliche Ausbildung ein Untertan des deutschen Geistes geworden ist. Nach einigen Jahren begab er sich wieder in die Heimat. Sechsunddreissig Jahre hindurch hat er—wie andere seiner Landsleute—unaufhörlich das deutsche Ideal der Forschung durch Wort und Tat in Amerika zur Geltung zu bringen versucht. Dass sein Streben nicht vergebens gewesen ist, wagt er daraus zu schliessen, dass er jetzt vor Ihnen als Austauschprofessor steht. Seine Ernennung zu dieser Professur ist ihm eine nicht zu überschätzende Ehrung. Seine Anerkennung kann er in diesem Moment nur dadurch zum Ausdruck bringen, dass er die ihm von Ihnen auferlegten Pflichten gewissenhaft und nach besten Kräften zu erfüllen verspricht.

Heute aber möge es mir gestattet sein, an erster Stelle Ihren Majestäten für die hohe Auszeichnung Allerhöchstihrer Gegenwart ehrfurchtsvollsten Dank auszusprechen. Auch danke ich Seiner Exzellenz dem Herrn Kultusminister und seinen Räten sowie Eurer Magnifizenz für die mir geschenkte Aufmerksamkeit. Allen meinen geehrten Kollegen und, last not least, den deutschen Kommilitonen wärmsten Dank mit dem Wunsche für ein gutes und erfolgreiches Semester.

Charles Sedgwick Minot

THE MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AT CLEVELAND IN 1853[1]

The twenty-eighth of July was the day appointed for the meeting of the American Association for the Advancement of Science. During the week after that date, Cleveland, the Forest City of the West, teemed with an unwonted convocation. Steamboats and railroad trains poured forth in her shaded streets groups of enthusiastic savants, bearing hither, as to a shrine, the fruits of their two years' thought and labor. In answer to a formal summons from the appointed hierarchs, the sunny South, the cold, contemplative North, the commercial East and the wilderness West sent forth their "representative men," their observers, their experimentalists and their philosophers, to give and to gather the unseen wealth of thought. Happy is the day when our geologists and naturalists, our chemists and engineers, our astronomers and mathematicians, our geographers and ethnologists, our physiologists and botanists, give to each other the right hand of fellowship, and come to know each other as coworkers in one great labor. It is a sight to gladden one's heart, when the modest and shrinking man of thought or genius, through the long years a lone laborer in his better than Californian or Australian mines, at last meets his compeers and finds the warm welcome and recognition which had been his early ambition, but had long ceased to be his hope. It is a moment when philosophers show forth the deep and strong human heart that is in them, when, after a long seclusion, they grasp anew the hand of such friendship as springs from sympathetic tastes and mutual respect.

Its constitution declares that "the objects of the association are, by periodical and mi-

[1] From *Putnam's Monthly*, Vol. 11, September, 1853, No. 9, p. 319 et seq.

gratory meetings, to promote intercourse between those who are cultivating science in different parts of the United States; to give a stronger and more general impulse, and a more systematic direction to scientific research in our country; and to procure for the labors of scientific men increased facilities and a wider usefulness." Collegiate professors, and the few who, scattered through the industrial and professional walks of life, have power and leisure to do something positive in the interpretation of nature, chiefly constitute this nomadic association. The sympathetic bond of scientific investigation, of endeavor at some point to transcend the line which divides the known from the unknown in nature and in man; this union of purpose is that central thread of connection which makes a unity of elements individually so diverse. This association is the U. S. Congress of Science, but one without parties or patronage, and in which all departments of genuine knowledge and philosophy find recognition and representation. In this convocation many of our noblest minds display their stores of rugged wealth, and genius here exhibits the pearls it has drawn from the depths of truth's great ocean. Calmly and soberly, with a style perhaps void of eloquence and grace, yet earnest, direct and truthful, does the inquisitor of nature tell of the confessions he has extorted from the animate and inanimate realms of the created. Feeble minds at times will expound crudities and venture rash flights, but some voice of sage philosophy or cool experience is ever at hand to correct misconceptions or cripple a too lawless wing. A generous and delightful spirit of amity has hitherto prevailed, almost without interruption, in these meetings, and great would be the pity and the shame if a less tolerant and courteous feeling should ever enter an assemblage devoted to objects so noble and elevating. He is more of an egotist than a true student of nature who can engage in fierce contention on points of science.

In September of 1847 "The Association of American Naturalists and Geologists," while assembled in Boston, decided to expand its organization so as to bring the entire field of positive science within its compass, and accordingly resolved itself into the "American Association for the Advancement of Science." The geologists created by the great necessity for geological exploration over our magnificent domain, and the naturalists engaged in parallel and often associated labors, found it necessary to band together, and at appointed meetings to learn from each other the results of their respective labors. As this association grew vigorous and compact the need of a broader basis for operations was felt, and at last led to that expansion which has made for us an association, organized on the same principles, and for the same ends, as the British Association for the United Kingdom, and the earlier general association for Germany.

The instauration meeting of this new body was held in Philadelphia, during September, 1848. A constitution was then adopted, which, with some modifications, is still in force. The idea was too new to meet with full success, and accordingly, that meeting, of four days duration, exhibits less of interest than the subsequent ones. Yet much was done towards making generally known what the objects proposed really were.

The second meeting was held in Cambridge during August, 1849. The venerable shades of Harvard swarmed with philosophers, and new voices resounded within her time-honored walls. A full attendance, numerous communications of interest and importance, many social courtesies, and a harmony which knew no check, made a *tout ensemble* held by many in delightful memory.

Next was appointed and held a semi-annual meeting at Charleston in March, 1850. Here several elaborate papers on geological and botanical subjects were presented, and the proceedings exhibited much variety. Unfortunately a gleam of middle-age intolerance dared to intrude and to foment some animosity under the cloak of religion. But we trust that the time is past when science need fear boldly to speak out its truths, however unwelcome or provocative of the *odium theologicum*. We hope the drama of Galileo will under all forms

and disguises be hereafter hissed from the stage.

The next meeting was held for a week during the latter portion of August, 1850, at New Haven. The quiet and beautiful city of elms extended a cordial greeting to the scientific soldiers who responded at the yearly roll call. The communications read were numerous and of marked interest, especially in the department of general physics. A semi-annual meeting was then appointed and in due time held at Cincinnati, during the second week of May, 1851; at which communications on geological subjects predominated. The total number of papers was about one half of that at New Haven. The most striking incident was the triumph of Professor Mitchell's method of recording astronomical observations.

The succeeding annual meeting was held at Albany, and was probably the most interesting of the series. The number of members in attendance (doubtless exceeding 300), the variety, interest and scope of the papers presented (being 134 in number), and the indefatigable hospitality of the Albanians, made up a week of continuous mental vitality and social ovation. The subdivision into sections was more complete than it had been before, and each section had full occupation.

It was there resolved to accept the invitation by the corporation of Cleveland to hold the next meeting in that city, commencing on the third Wednesday of August, 1852. The prevalence of cholera and other diseases in the west just prior to this date induced the standing committee to postpone the proposed meeting, so that no assembling of the association occurred until that which is just concluded. After fully canvassing the convenience of all concerned, it was decided to meet in Cleveland for the week following July 28, 1853. This meeting lasted five working days, and progressed with increasing interest, the number of papers being over eighty. A very decided preponderance of physical subjects was found to prevail, the departments of natural history and geology not being as strongly represented as usual. The non-attendance of Professor Agassiz, the Rogers, Dana, Hitchcock, Foster and other leading spirits, who always have ample contributions, was a deficiency seriously felt, and gave a too partial character to this meeting, which was much regretted. We trust that this is not to be construed into a lack of interest or of fealty on the part of the geologists and naturalists, and we hope that this association, their own foster-child, is not through their defection to become lop-sided and incomplete. That some disaffection exists we are well aware, but we would say in all earnestness, let not this be the means of dissevering this natural unit; rather let the next meeting be entered into with the hearty concurrence of all, and with the thorough resolution to waive all discordant memories, and at least to try again fairly to execute the fundamental idea of this association. We believe such an effort will be made, and that it will fully succeed. The Cleveland meeting came at a time inconvenient for many, nor was the place central; which, with the loss of interest consequent on the two years' interval, will explain the inferiority of this meeting to that held in Albany, without supposing any positive secession. Washington, the next point of meeting, is a place where all sections of the association should array their full strength and present the complete federation of the sciences in a representative congress. The last Wednesday in April, the soft, delightful month of flowers and foliage, is the appointed day of convocation. With congress in session, and nature in gala array, with a certainty of welcome and hospitality, with our capitol lions to be seen and our capitol orators to be heard and to hear, there would seem to be enough to insure a full and fruit-bearing meeting.

The election of officers at the Cleveland meeting resulted in the choice of Professor Dana, for president; Professor J. Lawrence Smith, for general secretary; Professor Joseph Lovering, of Cambridge, for permanent secretary, and Dr. Elwyn, for treasurer. These officers elect will enter on their duties at the next meeting.

The six volumes of proceedings of this association at the six meetings first held ex-

hibit a rich aggregate of research and suggestion covering a large part of the scientific specialities which have been cultivated among us. It is indeed lamentable that so large a portion of the most important communications made are not included in the proceedings, being, through the delays and neglect of their authors, entered as "not received." It is also matter of much regret, if not of complaint, that the presidents, with the exception of Professor Bache (who is the most occupied of all), have not furnished their annual addresses for these volumes. To us it seems incumbent on the president to make his retiring address an elaborate production, in which the general progress of science during the year shall be reviewed; or in which some large and positive subject of scientific interest and importance shall be thoroughly and yet popularly treated. For instance, we should have liked to have heard from Professor Agassiz a summary of what has been done, and what is still desired, in the natural history of North America. Or still better would we have relished from this highest source, a discourse on the intellectual element in organic structure. Why, too, should not Professor Pierce unfold a year hence, how America needs a real university, and what such a university should do if organized. Some *positive* subject should be chosen, or else the annual address should be a systematic *exposé* of what has been done during the year, as it usually has been made by the British Association presidents.

We are happy to record the generous action of Charleston, Cincinnati, Albany and Cleveland, in assuming the expenses of publishing their respective volumes of proceedings. The citizens or the corporations have in these instances taken on themselves the burden of publication; which generosity is alike an honor to them and to the association. This body has no source of income, except the fees of members, amounting only to $2 per annum, or $3 with the annual volume of *Proceedings* (just changed to $1 fee and *Proceedings* at cost). The liberality it has experienced is thus very fortunate, especially when we remember that the possession both of wealth and of philosophic lore rarely falls to the lot of the same individual. With all its utilitarian biases in these days, science rarely enriches the coffers of its cultivators, so that truly original researches are still well-nigh as unremunerated as in the wretched days of patrons. The moneymakers are usually two or three removes from the prime investigators whose search is for principles. Wide indeed is the tract between Castalia and Pactolus.

As the presidents and acting officers of this association are all men in whom the public has a certain right of property, and as they will well bear being delineated, it seems proper here to present, for such as may be strangers to them, a series of outline sketches of these post-of-honor-bearers in this migratory congress.

The first president was W. C. Redfield, Esq., who officiated at Philadelphia. A noticeable man, too, is Mr. Redfield. One would scarcely expect to find, under so placid and venerable an exterior, a spirit living in storms and hurricanes. Yet it is true that his keen eye is steadily bent on the wind bags (how invaluable had he been to Ulysses!), nor can a breeze indulge in any gyrations or irregularities but he is sure to put black marks against it in the books. Long has Mr. Redfield been a weather sentinel, and meteorology owes him much, both in the field of observation and in the far higher domain of speculation. But for a few live-minded men of this cast, rational meteorology would long since have been dead and buried in figures, which dull men can accumulate, though to interpret them requires the keen eye of subtle but patient reasoning. If, as is likely, Mr. Redfield is wedded to his theories, there is no lack of counter-theorists to battle his unproved positions, and in rather a stormy temper too; a fault which seems quite to beset our weather-seers, as if the shrewishness of our climate communicated itself to those who supervise its whimsicalities. Mr. Redfield is, moreover, a good geologist, having specially studied the fossils and fossil raindrops of the Connecticut valley red sandstone.

The second president was Professor Joseph Henry, the secretary of the Smithsonian In-

stitution, who presided at Cambridge. He is a hale and rather portly man, with a face alternating between abstraction and a very kindly consciousness, and looks as if he had a mission to work for man another score of years. He was born an experimental philosopher, and so lived at Albany and Princeton, until he was elected to his present administrative post. To his discoveries in electricity the telegraph owes its practical development, and we verily believe that with industry on his part, and a fair chance thus to apply himself, electrical science in all its fields might have owed him more than it does to Faraday. But this hope was extinguished under the southern tower of the Smithsonian Institution. There he is busy with what others, doubtless, could do as well; and thus is left undone what none other could do at all. This is a new instance of taking a man of proved abilities in one sphere to do what belongs to another and quite dissimilar one for which he has no birthmark. We ought to learn that men are of most value when doing that for which they have a special faculty, and it is a fair question whether Professor Henry, doing that for which nature intended him, would not during his life effect more in advancing science than the Smithsonian Institution in its aggregate existence is likely to do. High as this institution stands as a practical fact, and useful as it is and will be, if it is to extinguish the experimental researches of Professor Henry, we could fain say, give us back the man and let the institution go. Professor Henry lacks but mathematical training and energy of purpose to do something greater than has yet been accomplished among us in the domain of physical science. Will he do so? is the question. Facts within our knowledge assure us that this must and will be.

Next on the list of presidents comes Professor A. D. Bache, the superintendent of the Coast Survey, who presided at Charleston, New Haven and Cincinnati. He is a fortunate man in having found exactly the place for which nature and training have best fitted him. His quick eye, facile perception and actual attainments in science and in the knowledge of men make him the eminently able administrative man which he is fully admitted to be. Heading his class at West Point, encountering as an officer of engineers the stern actualities of engineering; as a professor and college president in Philadelphia achieving eminent success, he grew in that stature of mental training and experience which makes his eminence and usefulness in his present post a natural result. It is a rare thing to find so fortunate a combination of administrative and scientific talent, nor do we believe the country possesses another man who could so well thread the complications incident to Professor Bache's position. He is clearly Franklin's grandson. Whether, if permitted the requisite leisure, he would strike out and execute any great invention, discovery or research, is a question not easily answered; for though his original researches are highly creditable, especially in discussing the tides, they are, of course, only such as were compatible with his incessant life of action. The deeply reflective element whence the greatest achievements spring, has in him, as in most of our best men, been kept in abeyance by the intense externality and practicality of American life.

Professor Louis Agassiz was the next president, acting as such at the Albany meeting. He is a man of highest genius, who does great things quite naturally and yet with intense labor. Take him all in all, he towers quite above every living naturalist, and may not inaptly be called *Cuvier Junior*. His physique is of the noblest kind, and his ample forehead gives token of the mind within. He comes to us from the Alps, an Alpine man. Trained under Cuvier, and by him honored as residuary legatee to a large field of research; he has been an enthusiastic and most fruitful laborer in ichthyology, paleontology, glacial geology, animal classification, embryology, and especially has he carried new light among the inferior orders of animate beings. His work on Fossil Fishes has recently been crowned with the Cuvier medal, then given for the first time, though founded by Cuvier, who died in 1832. He was professor of natural history in

the Swiss university at Neufchâtel, until in 1846, when he came to this country, and was soon made professor in the Lawrence Scientific School, Harvard University. Here he has done distinguished service to natural history, and has been continuing the great labors of his life. A large cabinet has grown up around him, where he is buried in a multitude of special and general investigations, which unfortunately he rarely puts in form for publication, leaving scores of important researches and discoveries quite unrecorded. He much needs collaborators and reporters, to save his labors from oblivion. Among other herculean toils, he is maturing, and will in time present to the world, the broadest and completest classification of animated nature which has been made. From such a man was the discourse by the retiring president, this year, to have come, had not ill health prevented his attendance. We have doubtless thus been deprived of some of those exhilarating generalizations and enthusiastic bursts which so characterize his genius and indicate its superiority to the mere talent of the ordinary investigator or descriptive naturalist.

The president now officiating, and who presided at Cleveland, is Professor Benjamin Peirce, of Harvard University. As we look on his floating locks, furrowed brow, thin face and figure, and especially his clear, deep eye, it is not difficult to recognize the first American mathematician and physical astronomer. His mind plays football with transcendental functions, and runs algebraic gauntlets with a facility scarcely inferior to that of Cauchy, the preeminent mathematician of France, who, declining to swear by Louis Napoleon, was a few months since ejected from his government professorship in Paris. (Why will not some millionaire invite M. Cauchy to America, providing for him as Mr. Abbott Lawrence did for Professor Agassiz?) Professor Peirce is an excellent refutation of the usual slip-shod idea of a mathematician. He is a most interesting, earnest and cultivated gentleman, of marked kindliness and geniality, and excellent company for any man of sense. Scarcely could a less genial man so long make part of that most high-toned, refined and cultivated circle of college society in Cambridge, without at least an external exhibition of the humanities of culture and of life. So fully has the professor president mastered the perturbations of the planets, that he may be said to have put these wanderers under centennial bonds to keep the peace. When the world was all agog with Le Verrier's discovery of Neptune, through the perturbations of Uranus, Professor Peirce publicly declared that the planet discovered was *not* the planet called for by Le Verrier's theory; a bold saying that was, and we then thought a rash one, but he was quite right, as the daily confirmation of the lamented Walker's Ephemeris fully proves. Once, too, he was wrong; but when he found his error he was prompt to confess and disclaim it as publicly as possible: a nobler thing than convicting Le Verrier of oversight. Professor Peirce has long been a sort of backbone to the physical astronomy of the country, as has of late been shown in his services to the new Nautical Almanac; and we hope he may long survive to fill this post of labor and of honor.

At the fourth meeting, the only salaried officer of the association, that of permanent secretary, was created, and a salary of $300 per annum established, the term of office being three years. Professor Spencer F. Baird, of Dickinson College, Pennsylvania, now the Natural History Secretary of the Smithsonian Institution, was chosen to this new post. His duty includes arranging for reports of proceedings, the issuing of circulars to members, nearly all the current correspondence, and the charge of publishing and distributing the volumes of proceedings. The smooth working of the business matters of the association depends very much on the skill and fidelity with which the duties of this office are discharged; and it is fortunate that one so competent in every respect was chosen to it. Professor Baird was a favorite pupil and intimate friend of Audubon, and has made special attainments and copious collections in ornithology and ichthyology, besides a general study of natural history. With a physical and mental vigor developed in collecting specimens, and still

unscathed by time, he unites excellent business qualities, and thorough acquaintance with publishing. He is the American editor and chief translator of the Iconographic Encyclopedia, which, with his duties in publishing and distributing the Smithsonian contributions, has peculiarly qualified him for the labor of editing and publishing the association proceedings. Nor is there any one whose intimacy with the scientific men in this country is more general and desirable. His youth and mental vitality give assurance of many years of effective service still in those labors where he is already so much at home.

The general secretary of the association is Professor J. D. Dana, of Yale College, if one so cosmopolitan in knowledge and journeyings can properly be assigned to a locality. (Professor St. John, of Cleveland, acted in this capacity at the last meeting, as Professor Dana was unable to attend.) He is one of the solid human columns on which our national scientific reputation may safely repose. Beneath a kindly and modest exterior, he has managed to amass treasures of accurate knowledge, sufficient to stock many ordinary heads to repletion. He is indeed a man of wonderful scientific learning for one still in his fresh manhood; and this learning is made prolific by a philosophic and reasoning mind. Among American mineralogists he is *facile princeps,* as evinced by his treatise on mineralogy; and we much doubt if in this branch the world oan show his equal. The natural history of the Wilkes Exploring Expedition, which he accompanied, owes him a burden of obligation which will long be recognized by naturalists. Nor is it probable that a higher authority can be cited in respect to volcanic phenomena. These pipes of the Titans he has sniffed and scrutinized "the world around," having indeed carried on quite a flirtation with Pelée in the Sandwich Islands. His researches among the coral formations, and his writings thereon, take the very highest rank, and his monographs on Crustaceæ, Zoophytes and Medusæ would alone entitle him to the highest standing in natural history. As one of the chief editors of the *American Journal of Science* he is abundant in good deeds and good works. Professor Dana is not perhaps a man of the highest genius, but he will leave the world decidedly the wiser for his labors and researches, even though he do no more in the future. But we trust he will through many years be spared to apply his well-trained powers to the boundless researches ever inviting them.

Dr. A. L. Elwyn, of Philadelphia, is now, and has been nearly from the first, treasurer of the association. His distinction lies not in any particular department of science, but he is much interested in promoting it, and ever ready to aid its advance. He has paid much attention to agriculture, and has a model farm, on which he is laboring to give a scientific direction to the too empirical processes of the routine farmer.

And so ends our talk of the retired presidents, and actual officers, of this scientific body. We might dwell on the functions of the standing committee, which is its governing council of elders, but this would possess very little general interest. It is on nomination by the standing committee that new members are elected, and such nominations may be procured through any actual member, by any person really engaged in prosecuting positive science.

The subject of scientific advancement in the United States is one of peculiar interest and importance. The work which science has to do, in cultivating the vast field of descriptive knowledge presented by our still new continent, in ministering to all the common arts of life, in evolving the grand principles and mysteries of nature, and in nurturing a higher and more beneficent spiritual faith; this is a work of such transcendent moment, that our loftiest conceptions are but feeble images of the unseen reality. The whole surface and substance of modern life is undergoing a ceaseless transformation, through the manifold ministries which science is daily embodying in the forms and operations of manufacture and of art. Though no prophecy reveals what the future may have in store, it is still the confident anticipation of reason,

that new wonder-workings will not soon cease to flow from the *cornucopia* of speculative and experimental science. When we reflect how few are cultivating philosophical researches in our midst, and compare this petty band with the mighty results to be achieved through their labors, and the limitless harvest waiting for reapers, our spontaneous aspiration is, without stint, and by all legitimate means, to increase the numbers and strengthen the arms of this too feeble fraternity.

America has not yet attained that scientific maturity which must, we hope, ere long entitle her to claim a foremost rank in the world-federation of philosophy. Preeminent in all the mechanical and practical functions of living and of labor, we lack that deeper element of digested learning and reflective culture which will give continuous vigor and systematic power to our scientific progression. Our low tone of mathematical culture precludes us from all access to some of the richest placers of physics, and throws many of our ablest minds on a subtle and tricksy sleight of mind, in researches where the well-furnished investigator would cleave a sure, straight road to the end. With leisure and wealth will come an accession of solid strength and deliberate direction to our too spasmodic vaultings into the realms of discovery. When the man of science is relieved from the excessive labor, and stupefying routine of the professorial function, when research becomes a self-sustaining vocation, and when approved genius is permitted to address all its fire and energy to elaborating and verifying its originations; then American science, erect and self-reliant, will tower upward into a column of true national majesty, more honoring to us, and more diffusive of blessing to man, than even our glorious constitutional fabric. Speed that day, whoever can!

SCIENTIFIC NOTES AND NEWS

THE medal of the Society of Chemical Industry was presented to Sir William Crookes at a dinner in London, at which about 150 members and guests were present. The retiring president of the society, Dr. Rudolph Messel, F.R.S., made the speech of presentation, to which Sir William Crookes replied.

AT the last meeting of the board of trustees of Cornell University, Mr. Henry R. Ickelheimer, '88, of New York, a member of the board, expressed a wish to give the university a statue of Dr. Andrew D. White, and his suggestion met with the cordial approval of the board. He proposed to give the commission to Mr. Karl Bitter.

THE Buchanan medal awarded by the Royal Society to Col. William C. Gorgas, the chief sanitary officer of the Panama Canal Zone, was formally presented at the anniversary meeting of the society on November 30.

DR. W. J. HOLLAND, the director of the Carnegie Museum, has returned to Pittsburgh after three months' absence in South America. He installed in the National Museum at La Plata a replica of the Diplodocus presented by Mr. Carnegie to the Argentine Republic. He was tendered a banquet by the Academy of Sciences at La Plata, upon which occasion he was made an honorary member of the academy in the section of the natural sciences. On the eve of his departure for the north, he was tendered a banquet at Buenos Aires by the united faculties of the universities of La Plata and Buenos Aires.

PRESIDENT HENRY FAIRFIELD OSBORN and Dr. J. A. Allen will represent the American Museum of Natural History at the Ninth International Congress of Zoology to be held at Monaco in March, 1913.

SIR THOMAS CROSBY, the retiring Lord Mayor of London, although eighty-two years of age, is preparing to return to the practise of surgery after laying down his official duties.

MR. C. S. ORWIN has been appointed director of the institute for research in agricultural economics at Oxford University.

DR. G. ABETTI has been appointed assistant astronomer in the Vatican Observatory at Rome.

NORTHWESTERN UNIVERSITY will have as seventh Harris lecturer next spring Dr. J. S.

Ames, professor of physics in the Johns Hopkins University.

Dr. F. A. Pax has been appointed curator of the Zoological Museum of the University of Breslau.

Dr. Charles B. Davenport, director of the Station for Experimental Evolution of the Carnegie Institution, lectured upon "Heredity and Eugenics" before the Syracuse University Chapter of Sigma Xi and invited guests, on the evening of November 20. The chapter is planning for a series of public scientific addresses, of which this was the first, to be given during this college year.

Professor H. J. Webber, of Cornell University, will give in April a lecture on "Eugenics," for which Mrs. Huntington Wilson, of Washington, has given the university the sum of $100.

Dr. E. L. Thorndike, professor of genetic psychology, Teachers College, Columbia University, has given lectures on "Man's Original Nature," "Social Instincts" and other subjects at the University of Michigan, Northwestern University and the University of Illinois.

Mr. N. H. Darton, of the U. S. Geological Survey, presented an illustrated lecture to the New York Section of the American Institute of Mining Engineers at its November meeting. The subject was Structure of the Northern Anthracite Coal Basin relative to forms of folds. A map was shown in which the structure of the basin was represented by 100-foot contours.

Arthur H. Blanchard, professor of highway engineering in Columbia University, on November 25 delivered an address entitled "The Art and Science of Highway Engineering" at the celebration of Founder's Day at the Clarkson School of Technology.

Dr. James Woods McLane, a distinguished obstetrician, formerly dean of the College of Physicians and Surgeons, Columbia University, died on November 25 at the age of seventy-three years.

Dr. Wilhelm Ebstein, professor of internal medicine at the University of Göttingen from 1877 until 1906, died on October 22 at the age of seventy-six years.

The deaths are also announced of Professor Franz Kamienski, director of the botanical garden at Odessa, and of Dr. Arnoldo Minozzi, professor of chemistry in the Technical Institute at Padua.

Through the initiative of the medical department of the University of Pennsylvania the Rush Society has been established for the purpose of the diffusion by lectures of knowledge concerning recent advances in the medical and general biological sciences and in public hygiene. The objects are similar to those of the Harvey Society of New York. It is proposed to present during each academic year a program of not less than six or more than eight lectures. The first lecture will be given in January and arrangements are being made for three others before May 1. The program of lectures will be issued shortly. Lectures by Professor Theodore C. Janeway, of Columbia University, and by Professor M. J. Rosenau, of Harvard University, have already been arranged. At the meeting for organization of the society held on November 21, the following officers were elected: *President,* Richard M. Pearce; *Vice-president,* Alfred Stengel; *Secretary-treasurer,* William Pepper; *Councilors,* A. E. Taylor, A. C. Abbott, H. H. Donaldson.

The American Museum of Natural History has received from Mr. D. C. Stapleton the gift of valuable prehistoric objects in gold and platinum from the province of Esmeraldas, Ecuador, and the headwaters of the San Juan River, Colombia, and has placed the collection on exhibition in the South American gallery on the third floor. The objects show examples of casting and beating, of plating where copper has been covered with thin gold, of the union of two pieces of gold by welding and of the soldering of two minute surfaces in such manner that it is difficult to detect the solder. The objects in platinum are of most interest, as it is not known that

this metal was ever worked, except in this locality, by a prehistoric people. Through the generosity of Mr. J. P. Morgan, Jr., the museum secured recently the collections of minerals and meteorites left by the late Stratford C. H. Bailey, of Oscawana-on-Hudson. Mr. Bailey had assembled representatives of nearly three hundred falls and finds of meteorites. At least twenty-two of these are new to the museum's already great collection. The endowment fund of the museum has recently received an addition of five thousand dollars from Mrs. William H. Bliss. Mrs. Bliss has been elected a patron of the museum in recognition of her gift.

THE surgeon general of the army announces that preliminary examinations for the appointment of first lieutenants in the army medical corps will be held on January 20, 1913, at points to be hereafter designated. Full information concerning these examinations can be procured upon application to the "Surgeon General, U. S. Army, Washington, D. C." The essential requirements to securing an invitation are that the applicant shall be a citizen of the United States, shall be between twenty-two and thirty years of age, a graduate of a medical school legally authorized to confer the degree of doctor of medicine, shall be of good moral character and habits, and shall have had at least one year's hospital training as an interne, after graduation. The examinations will be held simultaneously throughout the country at points where boards can be convened. Due consideration will be given to localities from which applications are received, in order to lessen the traveling expenses of applicants as much as possible. The examination in subjects of general education (mathematics, geography, history, general literature and Latin) may be omitted in the case of applicants holding diplomas from reputable literary or scientific colleges, normal schools or high schools or graduates of medical schools which require an entrance examination satisfactory to the faculty of the Army Medical School. In order to perfect all necessary arrangements for the examination, applications must be completed and in possession of the adjutant general at least three weeks before the date of examination. There are at present thirty-five vacancies in the medical corps of the army.

IT is stated in the *Yale Alumni Weekly* that a pictorial story of iron from the time the ore is mined until it has been transformed into the finished product, such as steel rails or sheet piling, was a special feature of an exhibit of Rogers, Brown & Company, at the convention of the American Foundrymen's Association held in Buffalo, N. Y. For many months experts in motion pictures worked under the supervision of Henry B. B. Yergason, of Rogers, Brown & Company; the result is pronounced one of the most complete series of moving picture films ever made of an industrial subject.

IN spite of the decrease in the production of iron, the value of the total mineral production of the United States for 1911 reached the enormous figure of $1,918,184,384. Of this the value of the metals was $672,179,600, the remainder representing the non-metals. Coal led the list, with a value of $626,366,876; pig iron was second, with a value of $327,234,624; clay products third, $162,236,181; copper fourth, $137,154,092, and petroleum fifth, $134,044,752. These and other figures of production are discussed in an advance chapter from "Mineral Resources of the United States" for 1911, by W. T. Thom, of the United States Geological Survey. While the total value for 1911 is about $70,000,000 less than for 1910 it is greater than that of any other year except the banner year of 1907, when the $2,000,000,000 mark was passed. Indeed it is only in the last 13 years that the mineral output of the country has been above the billion dollar mark. Fourteen years ago, in 1898, it was only $724,272,854 and 10 years before this, in 1888, it was but a little over $500,000,000. In spite of the decrease in the total value of the mineral output in 1911, a considerable number of products showed a marked increase, 45 of the minerals for which statistics were collected by the Geological

Survey having increased in production, against 21 which showed a decrease. Thus, anthracite coal increased to the value of nearly $15,000,000; lead and zinc each increased more than $3,500,000; silver increased $1,750,000; petroleum more than $6,000,000; natural gas nearly $3,500,000, and sulphuric acid nearly $3,000,000. The products showing the greatest decreases were pig iron, more than $84,000,000; bituminous coal, about $18,000,000; clay products, nearly $8,000,000, and cement, $2,000,000, although the amount of cement produced was 1,750,000 barrels in excess of that produced in 1910.

An interesting fact in connection with the production of coal in the United States, according to the U. S. Geological Survey, is that in each successive decade the output is practically doubled. If the production of bituminous coal alone were considered, the record for the last fifty years would show an increase somewhat in excess of this ratio. The increase in the production of anthracite has been much less rapid on account of the limited area of the fields, the conditions under which the industry is carried on, and the restriction of the prepared sizes to domestic consumption. It has been estimated that the output of anthracite will reach 100,000,000 long tons annually before it begins to decline. The maximum production up to the present time has been 80,771,488 long tons. An increase in the annual production of bituminous coal may be anticipated for some time to come. The statistics of coal production in the past show that up to the close of 1865 the total output had amounted to 284,890,055 short tons. In the decade from 1866 to 1875, inclusive, the production amounted to 419,425,104 tons, making the total production up to the close of 1875, 704,315,159 tons. In the following decade, from 1876 to 1885, inclusive, the output amounted to 847,760,319 tons, somewhat more than double the total production during the preceding decade. At the close of 1885 the total production amounted to 1,552,075,478 tons, and the production during the ten years ended in 1895 was 1,586,098,641 tons, the total production at the close of 1895 amounting to 3,138,174,119 short tons. In the decade ended December 31, 1905, the total production amounted to 2,832,402,746 short tons, and the grand total from the beginning of recorded coal mining in the United States amounted to 5,970,576,865 short tons. The average annual production from 1896 to 1905 was 283,240,275 short tons; the average production from 1906 to 1911, inclusive, was 461,499,260 short tons, showing an increase of 178,258,985 short tons, or 63 per cent.

UNIVERSITY AND EDUCATIONAL NEWS

Mr. Peter Makoushin has founded at Tomsk, Siberia, an institution on a large scale, to be called the House of Science, intended to provide instruction of all kinds, including university courses.

By the will of Mr. Thomas Bartlett, Liverpool University receives £20,000 for scholarships for engineering students.

The South African Union has awarded five government scholarships in agriculture for study abroad. The holders of these scholarships will receive $750 per year during the three or four years for which provision is made. The successful applicants were obliged to pledge themselves to enter the service of the South African Union after completing their studies, and to remain in the service for at least three years at a salary not less than $1,500 per annum. Only sons of parents permanently domiciled in South Africa were eligible for the scholarships.

Plans for the new Gilman Hall of the Johns Hopkins University have been accepted by the trustees. The actual work of building will begin in the spring. Gilman Hall will be the largest building to be erected in the group at Homewood, the new site of the university. It will contain the library, seminary rooms for history, economics, philosophy and the languages.

Northwestern University has signed contracts for the erection of nine of the new dormitories which are to form a part of the

residence quadrangle system in the proposed development of the campus, and the foundations of the buildings are now being laid. Five of these houses will be owned by fraternities, and will be gifts of the alumni to the university for the use of their respective chapters. The nine buildings will accommodate nearly three hundred men, and will be open to students in the Evanston schools and also to those in the professional schools in Chicago. Buildings to be completed within the next two years will cost about $350,000. Alumni have agreed to give about $222,000 of this sum for the construction of houses for their fraternities.

THE new household arts and science building at the College of Industrial Arts, Denton, Texas, which is now in the course of erection at an expenditure of over $75,000, will be completed in the early spring. This building will be devoted exclusively to applied science and art as they relate to the home. Provision has been made for laboratories of food chemistry, textile chemistry and experimental dietetics. Also rooms are provided for mechanical drawing and home architecture, including china painting, clay modeling, pottery and other phases of ceramics. An auditorium with a seating capacity of about 1,100 is also included. The formal opening in April will also be designed to celebrate the tenth anniversary of the college, and several noted scientific men will be invited to be present and make addresses.

THE Faculty of Arts and Sciences of Harvard University has established a degree with distinction in natural history. The work of candidates for this degree will be supervised by a committee consisting of the chairmen of the divisions of geology and biology. The requirements for this degree are eight courses in the sciences, at least six of which must be in the divisions of geology and biology. Of the courses so designated, not less than three must be in the middle or higher groups; and not less than one must be taken in each of the divisions of geology and biology.

IN the department of geology at the University of Chicago, Albert Dudley Brokaw has been made an instructor in mineralogy and economic geology.

MR. WILHELM MILLER has been appointed assistant professor of landscape horticulture at the University of Illinois. The name of the appointee was incorrectly given in a recent issue of SCIENCE.

IN the University of Manitoba, Winnipeg, Canada, the following promotions have been made: R. C. Wallace, Ph.D., D.Sc., to be professor of geology and mineralogy; R. K. McClung, D.Sc., to be assistant professor of physics; L. A. H. Warren, M.A., to be assistant professor of mathematics. The following new appointments have been made: R. W. Moffat, B.A.Sc., of the faculty of applied science of Toronto University, to be lecturer in masonry construction and drawing; E. E. Bankson, B.S., the University of Pittsburgh, to be lecturer in materials and hydraulics.

DISCUSSION AND CORRESPONDENCE

PROFESSOR DE GROOT ON AMERICAN SINOLOGY

EUROPEAN scholars justly reproach us for our lack of interest in and knowledge of the far east. We admit that our position in this regard is not what it should be, but we claim to have made a beginning, and that, too, on sound lines, and we feel that we should have the credit for this. At any rate, we are not prepared for the insolent criticism recently passed upon us by Professor J. J. M. de Groot, lately of Leiden, now professor of Chinese in the University of Berlin. Professor de Groot is a self-styled sinologue. We are quite content that that type of sinology is not represented in this country, and we trust never will be. The present state of mental stagnation and petrifaction in sinology, justly ridiculed by the world at large, owes much to such pseudo-scholars of the oil lamp who must be regarded as relics of a past age. Professor de Groot no doubt can read a Chinese sentence; but that would seem about all. He certainly

understands little of the Chinese, and his lack of respect for China and things Chinese is so great as to place him quite beyond the pale of scientists.

Professor de Groot made his maiden speech in Germany at the July meeting of the Berlin Academy this year. His address is to be found on pages 607–612 of the *Sitzungsberichte der Königlich Preussischen Akademie der Wissenschaften* of this year. In the address occur these words:

> Sinology without a knowledge of Chinese thrives particularly well also in the United States. It is strong in the magazines, but abounds especially in the daily press. Information is imparted with the rapidity of the telegraph on the most complicated and profound secrets of the political, economic and social life of the Middle Kingdom—but the sources of this omniscience unfortunately, as a rule, are only from the bars of the foreign clubs in Shanghai, Tientsin and Hongkong.

The harshness and the undignified form of this assertion might be ignored did it not appear in such an important place as the Reports of the Royal Prussian Academy, a serious publication of one of the highest scientific institutions of Prussia. It is to be feared that this transplanted Dutch professor has little comprehension of what is really going on in the world; certainly he fails utterly to catch the spirit of modern journalism. What student of the Romance languages would cavil with his newspaper correspondent in Paris, who sends home each week his causerie of the goings on at the French capital, thus fulfilling a duty to his community? Or who demands of the Associated Press correspondent in Cairo or Constantinople, or even of the correspondent of the *London Times,* a knowledge of Arabic; or that the correspondent of the daily press in Bombay or Calcutta shall have a knowledge of Hindustani or be a Sanskrit scholar?

It has been my good fortune and my pleasure to become personally acquainted with many American, British, French and German correspondents in China. These men are confronted by an exceedingly difficult task. Without exception they do their best to perform this in accordance with the demand of the public and the present course of historical events. Our Associated Press for years has maintained in Peking an able, enthusiastic and well-trained man, who does most excellent work in educating the American public to a better appreciation of China. The work done by the Associated Press representative during the busy and stirring days of the revolution is excellent in the highest degree. He made no pretense of being a sinologue, but he worked day and night through interpreters to find out what was going on. He and his other fellow journalists, like the representative of the *Chicago Daily News* and the very able correspondent of the *New York Herald*—an old hand in the newspaper game—and the very able representative of the *New York Tribune,* all attempted and succeeded with eminent success in obtaining solid and reliable information from first-hand sources. In this work they were assisted by the Chinese Foreign Office and the whole body of Chinese officials who have for years made it a rule to supply the representatives of the press with news. Professor de Groot's bold statement that the information of the American press on China originates in clubs is a gross distortion of the facts and an utter violation of the truth. Professor de Groot's logic is at fault if he is unable to discriminate between this legitimate, honest, and most praiseworthy work of the newspaper correspondents and that which is expected of a sinologue or an ethnologist. Apparently, he is not able to understand that there are men in the world who see things at an angle different from that of the sinologue, and more is the pity that he should hold all in contempt that is not done according to his own one-sided way.

Professor de Groot's harsh criticism is all the more surprising in view of the fact that he was the guest of this country two years ago, having been invited by the Hartford Theological Seminary to lecture on the Chinese. It would seem that during this visit he should have gained some knowledge of the many-sided work done in America on Chinese research; but no evidence of this is to be found in his Berlin speech. This omission is so

significant that we succumb to the temptation to look a little further behind the ill-disguised vanity of this professor who poses as the only infallible authority on matters Chinese. There is a further reason for our doing this: in replying to Professor de Groot's speech, the Secretary of the Berlin Academy intimated that the professor's writings contained much information and valuable suggestions for one desiring to understand the actual politics of the China of to-day. A significant example of this kind of practical politics may be found in Professor de Groot's "Religious System of China," which is little more than an ill-digested mass of Chinese quotations couched in bad English. In Volume III., page 1052, we find this gem:

> Should European armies have occasion a second time to march on Peking, it will be worth their while to try whether the campaign can not be shortened and loss of life spared by military occupation of the burial grounds of the Imperial family. Indeed, should the Court receive an ultimatum that these tombs would be destroyed one after another by explosives, its belief in the efficacy of Fung-shui would be weakened, and the Court would implicitly submit to the foreigners' demands.

As a recommendation for a *modus operandi* to compel Chinese submission, this is, perhaps, without a parallel. Even the German government in the Boxer debacle of 1900 did not stoop to such depths. And yet, the paragraph just quoted is characteristic of the fiber of a man who professes to be a sinologue and shows neither a glimpse of sympathy with nor a particle of understanding of the Chinese people.

Professor de Groot's political zeal led him to accomplish a still greater triumph in the field of sinology. In 1904 he gave to the world, in two volumes, his "Sectarianism and Religious Persecution in China." In this he attempts to prove that the Chinese are the most intolerant people on earth, and he accomplishes his task by wilfully and maliciously ignoring the whole series of Imperial toleration edicts, of which the Jesuit missionaries are still proud. This sycophantic production was justly condemned by all thoughtful men; and, it is to be hoped, it will remain for all time a unique feat in the history of science that a university professor prostituted and humiliated his scholarship to political ends, dictated by an ephemeral fad of the time. No doubt many of our misconceptions of the Chinese are due to the distortions of missionaries, made with a view of proving their case, based on the necessity of their securing funds to carry on their work, but we are hardly prepared for such a perversion of facts at the hands of one who pretends to call himself a sinologue.

GEORGE A. DORSEY

RELATION OF PLASMA-GROWN TISSUE TO SENILITY

TO THE EDITOR OF SCIENCE: The success of the method for prolonging the life of tissues grown in plasma, devised in the laboratory of Dr. Carrel, has led to such a widespread misconception of its significance, as evidenced by articles in medical and semi-popular scientific periodicals, that a note regarding it may not be out of place. It is needless to say that these extravagant claims are not based on Dr. Carrel's conclusions as published, but upon independent interpretations of the results of his experiments.

The mere statement of the conclusions generally reached by writers in the above mentioned periodicals is sufficient to indicate their character, to the biologist at least. It is first claimed that the cessation of cell activity of the tissue in the plasma after twenty days or so is due to the same conditions which produce senility. Then it is pointed out that the actual cause of the cessation in the plasma is the accumulation of waste products, therefore the proof is complete and the great discovery at last accomplished, that senility is the result of the accumulation of waste products in the cells. On the same grounds death of a human being through uremic poisoning would be considered as due to old age, and a man suffocated by drowning be a victim of senility. Obviously there is no evidence that the causes which stop the activity of the cells in the plasma are the same as those which produce

senility. Senility is that cessation of activities that comes when external conditions are favorable.

Then, the fact that washing away the accumulated waste products at intervals leads to the reviving of the cell activities is considered to be a case of rejuvenescence and the conclusion drawn that since cell proliferation is more active at the end of eighty days than at the beginning, a method of obtaining immortality of the tissues has been discovered. Of course the normal length of life of the tissues used is several years, and indications of actual senility could not be expected before that time. The fact that the cells continue actively to proliferate has no significance as regards rejuvenescence, any more than the healing of a wound in the skin of an aged man by the normal processes of cell proliferation would indicate that his body was becoming juvenile. Cell proliferation in detached pieces of tissue is an expression of their inherent power of responding to form-regulation stimuli, which in living bodies governs the size and shape of the developing individual and even after maturity exhibits itself in regeneration of lost parts, production of new organs and in the processes of healing. The conditions in this respect of the cells of the detached piece, are evidently such as to call for the highest possible manifestation of cell proliferation, and this needs no other explanation.

The accumulation of waste products may be one of the results of the primary causes of senility, but even this much is not proved by these experiments.

H. M. Benedict
University of Cincinnati

SCIENTIFIC BOOKS

Die Muskeln des Stammes. By Paul Eisler. Jena, Gustav Fischer. 1912. Pp. 715, 106 figures, chiefly in colors.

This volume on the muscles of the head, neck, and trunk by Professor Paul Eisler, of Halle, constitutes a part of the extensive handbook of human anatomy now being edited by von Bardeleben with the cooperation of the leading anatomists of Germany. It is one of the most satisfactory of the series and illustrates how possible it is to make a real contribution in a field of work which for over three centuries has been as carefully cultivated as has gross human anatomy. The subject is considered from the purely morphological aspect, the mechanics of muscle action being left for treatment in other volumes of the series by Rudolph Fick. The only references to the physiological aspects of the subject relate to the theoretical developmental mechanics of the fascia, the tendons, and to a slight degree, of the muscles themselves. In the treatment of the various muscles of the head, neck and trunk admirable brief reviews are given of the various groups of muscles in each region. Then there follows an accurate description of each muscle of the group. The drawings to illustrate the various muscles are all from original sketches by the author, are all excellent, and in many cases are the best which have yet been made of the muscles treated. The topographical relations of the muscle are next considered and then the innervation. Eisler has made numerous personal contributions to this latter subject and gives a much fuller description of the innervation of the muscles treated than has hitherto been attempted. A brief description of the blood supply is next given and this is followed by an admirable summary of variations in structure, based not only on an extensive review of the literature, but also upon Eisler's own long experience in the dissecting room. Sometimes after the consideration of an individual muscle and always after the treatment of a group of muscles, the author gives an excellent summary of the comparative anatomy and the ontogenetic development of the muscle or muscle group. From "practical" considerations the author has, in the main, grouped the muscles according to the topographical relations in the adult, although he treats of the platysma with the superficial muscles of the head instead of with the muscles of the neck. This topographical grouping

sometimes makes the treatment of the innervation, the comparative anatomy and the development of the muscles less satisfactory than if the grouping in all cases were along morphological lines. In an extensive, scientific reference handbook, it would seem to the reviewer better, for instance, to group the sterno-cleido-mastoid and the trapezius together, rather than to class the former with the "muscles of the neck" and the latter with the superficial muscles of the back. Some repetition would thus be avoided and the morphological relations of the muscles would be emphasized. In spite, however, of the traditional general classification of the muscles according to adult topographical relations, the author gives an exceptionally clear account of the morphological relations of the muscles and some excellent illustrations based on this point of view. The topographical treatment is an aid in the discussion of the fasciæ. After treating of the muscles of each part, as, for instance, of the head, the author gives an extensive description of the muscle fasciæ, the most extensive and satisfactory which has yet appeared. The fasciæ he justly considers not as independent organs, but rather as local thickenings or strengthenings of the general connective tissue framework, the thickness, structure and extent of which depends upon the mechanical stresses to which the part is subjected.

The author's style throughout is so clear, his summary of the literature is so satisfactory, his own contributions are so welcome and his point of view of the theoretical aspects of the subject is so suggestive even when one does not accept all the conclusions reached, that one can not but regret that the mechanics of muscle action have not to some extent been considered along with the morphological aspects of the subject. While this would have necessitated some repetition of the extensive field covered by Fick in the volume on special joint and muscle mechanics in the same "Handbook" it would, none the less, add not a little to the interest of the study of the detailed anatomy.

Not the least satisfactory part of the volume under review is the section devoted to the general aspects of myology. Here an admirable review is given of the more recent literature on the histology of striated muscle fibers, their physical and chemical characteristics and their development, and of the general structure of the voluntary muscles. In general opposing views of disputed points are fairly presented. The discussion of the connective tissue in relation to the muscles is especially good. Eisler, however, accepts O. Schultze's apparent demonstration of the continuity of the myofibrils with the connective tissue fibrils attached to the sarcolemma with less reserve than would seem to the reviewer justified. The general, like the special, treatment of the muscle fascia is a contribution of importance.

Taking the volume as a whole, it should prove of much value not only to those interested in scientific human anatomy, but also to the zoologist interested in comparative anatomy.

C. R. BARDEEN
UNIVERSITY OF WISCONSIN

The Physiology of Protein Metabolism. By E. P. CATHCART, Ph.D., D.Sc. Monographs on Biochemistry. Longmans, Green and Co. 1912. Pp. viii + 142. Price $1.25.

Like the other monographs of this series, this book is from the pen of an ardent investigator in the field of which he writes. To those who derive their knowledge of the subject of nutrition from text-books, the present volume will offer numerous surprises. In many places the treatment consists in the exposition of the various points of view of specific problems relating to protein metabolism, which rest upon experimental data, and does not therefore furnish a complete and harmonious story. This style of treatment is most commendable, for with no other attitude could the author give an adequate picture of the state of our knowledge of this complex subject.

The book surveys the literature up to the end of the year 1910, and appeared at a rather unfortunate time, for never in the history of

protein metabolism investigations, have such enlightening studies been published during any like period as during 1911 and the first half of 1912. The admirable work of Osborne and Mendel on the physiological rôle of the individual proteins, and of Folin and Denis on the fate of the products of protein digestion after absorption, came too late for inclusion in this edition.

The author has succeeded admirably in adhering closely to the physiological aspects of protein metabolism, a difficult task, when a vast amount of experimental data relating to the chemical aspects of the same subject is now available. This attitude is a desirable one at the present time, when there is a strong tendency on the part of text-book writers and dietitians to assume that an adequate supply of "building stones" in the diet is all that is essential to insure physiological well-being in the animal. The author has done a good service to his fellow workers in producing a treatise which will assist in creating new attitudes toward the problems concerned, and to the great number of teachers who follow the original literature to but a slight degree or not at all, in presenting in so clear a form, the experimental lines of inquiry directed toward the solution of problems of protein nutrition, and the different points of view to which these have led.

E. V. McCollum
University of Wisconsin

Scientific Results of the Voyage of S. Y. "Scotia" during the Years 1902–1904. Vol. III., Botany. Edinburgh, The Scottish Oceanographical Laboratory. 1912. 4to. Pp. x + 153, 12 pl., 1 chart.

Nearly simultaneously with the publication of this volume, now dedicated to his memory, Sir Joseph Hooker, the dean of botanists and the author of the "Flora Antarctica," passed from his earthly labors. The botanical results of the Scottish National Antarctic Expedition are derived principally from two summer visits to the South Orkneys and a winter spent at Laurie Island in Scotia Bay; a hasty visit to Gough Island; extensive collections of the algæ of Weddell Sea; notes on the botany of Ascension Island; and incidental collections made on the outward and homeward voyages. The report on the phytoplankton will be issued later.

The present volume opens with an introduction by Dr. Rudmose Brown on the problems of Antarctic plant life. Recent explorations have shown that the South Polar flora is in some respects richer than has been supposed, though its chief interest is derived from its relations to the problems of geographical distribution and the origin of the Antarctic flora.

With the exception of a doubtful fossil of conifera, possibly of Devonian age, found in Victoria Land, the known Antarctic fossil plants are those obtained by Otto Nordenskjöld from Hope Bay, Graham Land, ferns, cycads and conifers indicating a warm moist climate and abundant vegetation in Jurassic times. The fossil *Araucaria, Fagus,* etc., found at Seymour Island by the same expedition indicate the extension of somewhat similar conditions into the Tertiary.

The most striking feature of the Antarctic flora is its poverty compared with that of the Arctic. Spitsbergen in summer in 79° north latitude supports a hundred species of flowering plants, while at the South Orkneys in only 61° south there is not a single species. In Grant Land, in 81° and 82° north latitude, Peary collected 57 mosses and 7 hepatics, more than are known from the whole Antarctic region south of latitude 60°.

The explanation lies chiefly in the fact that while the Arctic summer mean temperature is well above the freezing point, that of the Antarctic is practically always below it. Another factor is adverse to the establishment of plants on the few snowless patches of Antarctic land, namely, the presence of myriads of penguins, which cover these areas with their guano and trample them into mud whenever the temperature is above the freezing point. The few sheltered spaces where mosses occur are poorly suited to flowering plants. Yet that their introduction is possible by natural causes is indicated by the discovery of

pollen grains of the South American *Podocarpus* in the snow of South Orkney by Dr. Fritsch.

There are only two phanerogams known from the Antarctic, *Descampsia* and *Colobanthus*, which are the most southerly flowering plants known. There are no ferns, and mosses form the major terrestrial plant population, 52 species being known, of which 24 are endemic. The lichens are conspicuous, but few in species. The algæ, especially the unicellular kinds are abundant.

All the known facts, according to Dr. Brown, point to a Fuegian origin for the flora. A greater former extension of glaciation, which is well proved, is regarded as inimical to the descent of any part of the present flora from that of Tertiary times.

Beside the chapters on the botany of the South Orkneys, Gough Island and Ascension Island by Dr. Brown, Cardot contributes a general review of the mosses; Gepp, Holmes, Foslie and Fritsch treat of the fresh-water and marine algæ; and Harvey Pirie contributes notes on Antarctic bacteriology. The volume concludes with a useful bibliography of Antarctic botanical publications.

WM. H. DALL

A Text-book of Physics. Edited by A. WILMER DUFF. Third Edition. P. Blakiston's Son & Co. 1912.

The third edition of Duff's "Physics" is a great improvement typographically over the previous editions, and is consequently so changed that if it were not for the uniform binding of the three editions it would appear at first glance to be an entirely new book. Practically all the cuts have been made over from new drawings, with a noticeable increase in clearness and uniformity of size, or have been replaced by other and better ones. This, with the choice of better type, makes the reading much easier. As in the previous editions, the main subdivisions are by different men, but the order has been changed, "Wave Motion" coming after "Mechanics," and "Sound and Light" after "Electricity"; and there seems to be more unity of treatment in the whole and a natural connection between the parts which saves them from appearing as disjointed treatises. The text of the "Mechanics," by A. W. Duff, is practically unchanged from the previous edition, and the same may be said of "Wave Motion," by E. P. Lewis, and "Sound," by Wm. Hallock. "Conduction of Electricity through Gases and Radioactivity," by R. K. McClung, has a few changes and additions noticing some recent developments, but is otherwise unchanged. "Light," by E. P. Lewis, has been reduced in amount and improved by being partly rewritten and rearranged (though it previously possessed considerable merit). The portions on Heat and Electricity and Magnetism are entirely new. The part on Heat is by C. E. Mendenhall, of the University of Wisconsin, replacing that by K. E. Guthe in the other editions. The arrangement of the subject matter seems to be more logical and more briefly stated, and there is an improvement in the choice of illustrations, but in places there is less clearness of statement and treatment than in the previous edition. Nowhere is the improvement in the drawings more noticeable than in the case of "Electricity and Magnetism," by A. P. Carman, of the University of Illinois, which replaces that by A. W. Goodspeed in the previous editions and comprises also the former section by Professor Carman on Electromagnetic Induction, thus securing a desirable unity of treatment in this subject. Taken as a whole the parts of the book are remarkably well welded together, and, having as authors specialists in the different departments, it should rank among the best college texts of the day.

LOUIS A. PARSONS

Maschinen und Apparate der Starkstromtechnik (Machines and Apparatus for Heavy Currents). By GUSTAVE M. MEYER. Published by B. G. Teubner, of Leipzig and Berlin. 1912.

So rapid has been the development of machines and apparatus used in connection with the many applications of electricity to power purposes that it is well-nigh impossible

for any one to follow carefully the progress in inventions and research. Electrical engineers have desired some book which would give in concise form descriptions of electrical machinery and numerous auxiliary devices used in conjunction with them. Few of us have time or opportunity to become thoroughly familiar with more than one specialty.

Furthermore, preliminary work in universities requires a book which describes briefly the most important features of various forms of electrical apparatus. There are at present electrical treatises which specialize and at the same time emphasize theory more than they do practical operation. Other books are practically compilations of extracts from patent specifications and catalogues, many of them describing obsolete or impracticable apparatus; such works are usually lacking in critical comment. Appreciating the need for this type of book, Mr. Meyer has brought forth in his "Maschinen und Apparate der Starkstromtechnik" a book which would meet the existing demands. Believing that books on electric lighting and railroads are now sufficiently numerous, the author has omitted these phases of the subject. On the other hand, he has endeavored to give such information as the consulting engineer and student desire, relative to high-voltage apparatus and their applications, as well as descriptions of turbo-generators and alternating current commutator motors.

The book is divided into two principal parts, viz: Direct Current and Alternating Current. The first part the author devotes to direct current measurement, control and storage of electrical energy; direct-current generators and motors, their uses, specific applications, and auxiliary apparatus. The second part, comprising about two thirds of the book, deals with measurement and control of alternating currents; construction and performance of alternating current generators and induction motors; alternating current transformers; distribution of electrical energy by means of alternating currents; and several kinds of attendant or auxiliary apparatus used in conjunction with alternating current.

The author has devoted considerable attention to the characteristics of alternating current machinery such as turbo-generators, synchronous generators and motors, and induction motors, as well as to speed control by means of commutator motors, these including the systems of Scherbius and Kraemer. Space is also given to various forms of alternating current commutator motors, such as the repulsion, the series and compensated types, with which latter the names of Latour, Winter and Eichberg are associated.

It could hardly be expected that a book covering so great a field could be without errors. For example, a means is given for determining the regulation of A.C. generators from the no-load saturation and short-circuit characteristics, and while armature reaction, and armature self-inductance and resistance are considered, the effect of incremental pole leakage with load has been entirely neglected. It is well known that when the poles are saturated, the change in pole leakage with load at fractional power factors has a not inconsiderable influence upon the regulation. More emphasis than is necessary is placed upon the influence of the resistance of the stator at zero power factor; this is generally negligible when the current lags behind the electromotive force by 90 electrical degrees.

The book has a remarkably small amount of mathematics and hence it should be easy for any one to follow who is studying along these lines or attempting to familiarize himself in a general way with a part of the subject differing from his specialty. The text contains 590 pages, including 772 illustrations pertaining, so far as possible, to modern machines, both European and American. It would be impossible, however, for a book of this character to be up-to-date some years hence, as electrical apparatus becomes obsolete in a comparatively short period. The author has wherever possible given his authority, so that any one desiring further information can refer to same for a more complete understanding of the subject.

Carl J. Fechheimer

October 29, 1912

BOTANICAL NOTES

MYCOLOGICAL NOTES

As usual the new Report of the State Botanist[1] is very largely given over to the classification and description of the larger fungi. Nine colored plates, mostly of the edible fungi, accompany the report.

C. N. Jensen's "Fungous Flora of the Soil"[2] brings together what is known as to the fungi ordinarily to be found in the soil. After a general discussion of the subject accompanied by the citation of many publications, the fungi are arranged and described in systematic sequence. In the latter part there are many helpful figures in the text.

Professors L. R. Jones, N. J. Giddings and B. F. Lutman publish[3] the results of their investigations of the potato fungus *Phytophthora infestans*. It is a summary of the present state of our knowledge of this parasitic fungus, and includes a long list of the literature of the subject (105 titles), and ten plates.

Miss Frances Dorrance (Dorranceton, Pa.) has made an English translation of Part XIII. of Dr. Oscar Brefeld's "Investigations in the General Field of Mycology." Only 150 copies were printed and these were privately distributed. The work appears to be carefully done, and since this part relates to Smut Fungi, the translation should have a wide sale. ($1.75.)

SYSTEMATIC NOTES

"THE North American Species of Nymphaea" is the title of a paper by G. S. Miller and P. C. Standley, and is issued as one of the Contributions from the U. S. National Herbarium (Vol. 16, Pt. 3). The genus here monographed is what many of us learned as *Nuphar,* and includes the Yellow Water-lilies of the country. After a long study of these plants the authors are able to recognize nineteen species for North America, five of which are quite widely distributed, viz.: *N. microphylla* Pers. (eastern Canada, New York to New Jersey), *N. rubrodisca* (Morong) Greene (Canada, New York to New Jersey), *N. americana* (Prov.) M. & S. (eastern Canada to British Columbia, south to Nebraska, Ohio and New Jersey), *N. advena* Ait. (New York and New Jersey to Wisconsin, Nebraska, Kansas, Kentucky and North Carolina), *N. polysepala* (Engl.) Greene (Alaska to California, eastward to Colorado and South Dakota). The illustrations and maps showing distribution of species add to the value of the paper.

Dr. William Trelease essays a classification of the Black Oaks in a recent paper in the *American Philosophical Society* (Vol. LI., 1912), accompanying the paper with four plates of buds and acorns.

THE RETURN OF THE NATIVE FLORA

RECENTLY Professor M. R. Gilmore, of Lincoln, called my attention to an observation which he had made upon the return of the native flora on an abandoned tree plantation on the high Nebraska plains. At my request he has given the particulars in the following summary statement:

It is a problem of much interest to the writer hereof to observe the repossession by the native flora of areas from which it has been dispossessed. Among the places of which particular note has been made was an abandoned tree claim in Sheridan County, Nebraska, in the topographic region known as the High Plains, popularly called the Short-grass Country. This observation was made in the first week of August, 1912, on a tract of land about six miles northwest of Rushville, Nebraska, which had been entered under the Timber Claim Act of Congress. The number of acres required by law to be planted with trees had been broken out (plowed) and set in elm and ash trees, and after that nothing more had been done to the land, so that for about twenty years the original flora has been gradually repossessing the ground. I estimated that about 5 per cent. to 10 per cent. of the trees were still struggling to live, being in no case more than ten feet tall, and in most cases not more than two and a half feet tall and many less than that. Following I give a list of twenty-five species by name which I found to be stably reestablished, besides which I found half a dozen or more others which I did not identify. Those identified were: *Bulbilis dactyloides* (Nutt.) Raf., *Stipa comata* Trin. and Rupr., *Malvastrum coc-*

[1] Bull. 157, N. Y. State Museum.

[2] Bull. 315, Cornell University Expt. Station.

[3] Bull. 245, Bureau of Plant Industry, U. S. Dept. Agric.

cineum (Pursh.) A. Gray, *Pentstemon* sp., *Artemisia frigida* Willd., *Brauneria pallida* (Nutt.) Britton, *Grindelia squarrosa* (Pursh.) Britton and Rusby, *Astragalus* sp., *Psoralea floribunda* Nutt., *Erigeron* sp., *Kuhnistera purpurea* (Vent.) MacM., *Lithospermum* sp., *Ratibida columnaris* (Sims.) D. Don., *Antennaria campestris* Rydb., *Verbena hastata* L., *Verbena bracteosa* Michx., *Helianthus scaberrimus* Ell., *Carduus altissimus* L., *Bœbera papposa* (Vent.) Rydb., *Solidago* (two species, unidentified), *Aster* sp., *Solanum carolinense* L., *Rosa arkansana* Porter.

Charles E. Bessey
The University of Nebraska

PALEOLITHIC MODELERS IN CLAY

The discovery, on July 20 last, by Count Bégouen and his two sons, of a new French cavern with paleolithic mural decorations has already been noted in Science.[1] This cavern, called Tuc d'Audoubert, situated near St. Girons (Ariège), was visited by the writer five days after its discovery, but did not even then yield up all its secrets. We noted certain small openings leading apparently to other galleries then closed against us by deposits of stalactite and stalagmite. At Geneva in September Count Bégouen informed me that he had entered one of these and found additional parietal engravings. In a communication to me dated October 23, he announces that at the end of still another long and difficult upper gallery, reached only after breaking away stalagmite pillars, he and his sons have found two clay statuettes intact, representing the *Bison*, male and female 63 and 61 centimeters long respectively. In an antechamber as well as the upper gallery these Magdalenian artists also left their footprints on the soil superimposed on footprints of the cave bear, whose skeletal remains were strewn upon the cavern floor. All the canines were missing, however, from the jaws, having evidently been removed as Magdalenian trophies. A perforated tooth (Bovidæ) and several flint implements were found on the cavern floor.

The artist races inhabiting southern Europe in later paleolithic times were sculptors of real merit. They worked laboriously in stone, ivory, bone, and horn with excellent results and without the use of metal tools. That paleolithic man had realized any of the possibilities of clay as a plastic medium has always been denied. Absence or presence of pottery has been universally invoked as a chief factor in distinguishing paleolithic and neolithic horizons. The clay figures found by Count Bégouen are unbaked, to be sure; but they prove that only the accident of firing stood between the Magdalenian races and one of the great inventions of all time. These figures were never wholly separated from the matrix out of which they were fashioned. They seem to stand out of a clay talus slope that flanks a fallen rock, the male following the female. For the present no attempt will be made to remove them from this shrine.

George Grant MacCurdy
Yale University

[1] August 30, 1912, p. 269.

THE PROGRESS OF MOUNT ROSE OBSERVATORY, 1906–1912

Mount Rose Observatory, although the youngest of the meteorological observatories in America, has an environment so unique that its staff has not only obtained a series of problems of prime importance to pure science and to agriculture but has also found such abundant material that rapid progress has been possible in their solution. A brief statement of plans and progress at this observatory may, therefore, not be without interest to workers in the meteorological field.

Mount Rose is a peak of the Sierra Nevada Mountains at the western edge of the Great Plateau. The observatory on the summit, which is 3,292 meters above sea level, at present is the highest meteorological station in the United States, and was established privately for the purpose of ascertaining the winter minimum temperatures at the summit of the Sierra. Later it was made a department of the University of Nevada and the Agricultural Experiment Station and through these institutions has received financial aid from the state and from the Adams Fund of the Office of Experiment Stations.

The observatory is very favorably situated for the study of mountain and desert meteorology, the relation of topography to the occurrence of frost, and the influence of mountains and forests upon the conservation of snow. Most of the instruments and methods employed in the work of the observatory have been devised by its staff.

In the study of mountain meteorology, the observatory has the advantage of occupying a virgin field, and thus being placed in a position to supplement the work done at Mount Royal by McGill Observatory, in the Appalachians by the Mount Washington, Blue Hill and Mount Weather observatories, in the Rocky Mountains at Pikes Peak, and in the Coast Range at Mount Tamalpais. Mount Rose Observatory is unlike its predecessors in that no observer is maintained continuously on the summit, and most of the instruments in use have been constructed to work without attention for long periods of time.

After much experimenting there has been devised a meteorograph that is impervious to the wild storms that rage in winter on mountain summits, and a shelter has been constructed for it that clears itself of accumulated snow. Six elements are recorded, viz.: pressure, temperature, direction and velocity of the wind, humidity and sunshine. The records are made upon a band of metric cross-section paper 270 mm. wide, which moves 2.5 mm. an hour or 1.8 meters a month. The recording mechanisms are adjusted to the ruling of the paper so that one millimeter equals one degree of temperature, two per cent. relative humidity, and one millimeter of atmospheric pressure. The meteorograph is actuated by springs placed within a motor drum. Two auxiliary drums serve to hold and receive the paper as it passes over the motor drum against which the recording pens rest. This instrument will run for at least two months with one winding of the clock. The resetting of the meteorograph is readily accomplished by disconnecting it from the shelter and removing it to the observatory building.

Some defects that occasionally cause failure to obtain satisfactory records have been partially corrected in the following manner: To prevent slipping of the record sheet, a double series of tiny needle points has been fitted into the motor drum with v-edged pressure wheels running astride of them to force the sheet close to the drum. To detect possible inaccuracy in the motor clock, a standard pendulum clock actuated by weights has been installed in the observatory building and connected by electric cable with a pen in the meteorograph to record the twelve o'clock hours each day. Excessive vibration has been eliminated in the shelter by the use of heavy braces and rock on the sills.

Mechanical registration is employed in all elements except sunshine, and the performance of electrical devices tried thus far has been so unsatisfactory that probably a mechanical sunshine recorder will eventually replace the electrical one. Dry batteries have been made worthless by freezing, and the efficiency of wet batteries is so reduced in cold weather that it seems improbable that any system depending on electricity will be successful.

The great problem is the prevention of the formation of fins of ice and frost upon the instruments. The sunshine recorder has been safeguarded by a heavy bell-jar. The tail of the anemograph vane has been made of wood and the arrow so shortened that the vane will swing into the eye of the wind irrespective of ice accumulations on the arrow. The masts have been enlarged in size and made self-sustaining without guy rods, which invite the formation of festoons of heavy ice with consequent wrecking of the masts. The only serious problem of equipment still unsolved is the protection of the cups of the anemometer from ice. This can be accomplished in part by removing the portion of the supporting arms that pass through the cups and thus expedite the dropping of the accumulated slugs when the cups are warmed by the returning sun. However, there may be some material, such as vulcanized rubber or papier mâché, of which cups can be made, which will be less attractive to frost and ice than the metals used at present. The wind record has usually been

complete between the months of May and October.

This meteorograph on the summit (elev. 3,292 meters) is flanked by two similar instruments, one on the west at Truckee (elev. 1,798 meters), thirty miles distant, and the other on the east at Fallon (elev. 1,208 meters), fifty miles distant, thus affording a base line eighty miles long and an apex approximately one mile high. Kite flights have been inaugurated to determine the meteorological error of the summit station. By means of this vertical triangle of stations, data are now being actively gathered on the changing phases of passing storms, and their possible relation to the weather of the valleys beneath.

A station with instruments of great precision is being established on the university campus. The study of the movements of air currents will be made by pilot balloons, for the plateau is too sparsely settled to permit the use of ballons-sondes. A share will also be taken in the international kite flights.

In the realm of applied science, the forecasting of frost from mountain tops is one of the two main problems through which it is desired to make the observatory of practical service. This problem is still in the stages of data-gathering; however, some relationship is evident between the passing of storms and the occurrence of frost.

This problem has given rise to two others: the relation of topography to the occurrence of frost, and a temperature survey of the agricultural lands of the state of Nevada. For the study of the first problem, two stations with delicate apparatus for detecting minute changes in humidity, temperature and air movements are under preparation to be placed near the surface on typical slopes in conjunction with a free air station at the university.

The temperature survey has now been in progress for two seasons. The purpose of the survey is the delimiting of large areas suitable for fruit raising under all forms of economic frost prevention, and the further division of these areas into thermal belts according to the following classification:

(*a*) Belts where the minimum temperature never falls below 28° F. and fruit raising would be highly profitable.

(*b*) Belts where the minimum temperature is between 24° and 27° and frost can be combated at a reasonable expense.

(*c*) Belts where the temperature falls between 18° and 23° and fruit raising as an industry would not be profitable.

In belts where temperatures of 17° or lower are encountered fruit raising is not advisable.

Eighteen stations equipped with thermographs and standard thermometers are now being employed in the work. The number may finally be increased to twenty-five. These stations are distributed at strategic points from the highest land under irrigation canals to the lowest parts of the valley. It is planned to obtain continuous records at each station for three years before removing the station to a new point. The survey at present covers the basin of the Truckee River, on which is situated the metropolis of the state. Owing to the hearty cooperation of ranchers, who act as voluntary observers, the expense of the maintenance of the survey is slight.

In the spring of 1911, when frosts were heavy and frequent, the observatory staff, in conjunction with others, demonstrated the feasibility of orchard heating even under strenuous conditions, with the result that where only one farm corporation was heating its orchard that season, the present year between fifteen and twenty owners of fruit trees were engaged in the work. To give the orchardists assurance of support in their effort, a night telephone service was maintained for emergency frost-warning and two automatic frost alarms were installed. To further aid the isolated orchardists in making their own forecasts of frost, an analysis of the fluctuation of temperature under semi-arid conditions is now being made. To this will soon be added the determination of the quantitative effect of cloudiness and wind on the retardation of falling temperatures.

The second problem to which special attention is being devoted is the influence of mountains and forests on the conservation of snow.

This problem is of vital importance to irrigationists and power companies wherever streams are fed by snow.

The data for the study of this problem are very abundant. Mount Rose is situated between the heavily forested main chain of the Sierra Nevada and the scantily forested ranges of the semi-arid Great Basin, and forms the natural headquarters for the study of both. On the flanks of Mount Rose and its subjacent range are also wide areas long since deforested and now in various stages of reforestation, while the apex of the mountain furnishes abundant opportunity for studying the snow where it falls deepest and longest. The observatory building on the summit has now been supplemented by a headquarters camp, made of sandbags, at Contact Pass (elev. 2,744 meters) and another camp at the base of the mountain. By means of this chain of stations, measurements of snow depth and density, the evaporation of snow, and temperatures within the snow have been conducted on the mountain for limited periods.

Adjacent to Mount Rose is the basin of Lake Tahoe, where a coast line seventy miles long has furnished ready access throughout the winter, by means of motor boat and explorer's camp, to forests of various types and densities, and to all the typical slopes and elevations found in the Sierra Nevada.

The study of the conservation of snow was begun with camera in the winter of 1906, and in the spring of 1909 there was designed a snow sampler by means of which cores can be obtained from snow-fields of all depths and densities, the water content of the sample being determined by weight. Soon after, a spring balance was devised that would indicate without any computation the equivalent water in the sample irrespective of variation in the length or weight of sampler used. By means of these instruments thousands of measurements have been made, and the quantitative value of forested areas and their superiority over unforested was early established.

The minute investigation of the various phases of the problem has proceeded more slowly, but considerable progress has now been made toward their solution. The general principle underlying the conservation of snow is that of protection against evaporation and melting by wind and sun. Snow lies longest where it falls deepest. Cliffs and lee slopes are large gatherers of snow. Yet wherever forests crown such slopes the capacity of these slopes to gather and conserve snow is increased. In wind-swept regions, timber screens have a snow-gathering capacity varying according to their height and imperviousness to the wind. They also, by checking the wind, reduce the evaporation of snow, which under the influence of a wind movement of 33 miles per hour, despite the fact that the snow was frozen, has reached in a single night the total of .10 in. moisture content, or one one-hundred-twentieth of the total snow on the ground.

The action of unbroken forests upon the snow is unlike that of timber screens, particularly on the lower slopes where the wind is less violent. These forests catch the falling snow directly in proportion to their openness, but conserve it, after it has fallen, directly in proportion to their density. This phenomenon is due to the crowns of the trees, which catch the falling snow and expose it to rapid evaporation in the open air, but likewise shut out the sun and wind from the snow that has succeeded in passing through the forest crowns to the ground.

The most efficient forest, therefore, from the point of view of conservation is the one that conserves the largest amount of snow to the latest possible time in the spring. This has been found by measurement to be the forest with a maximum number of glades, which serve as storage pits into which the snow can readily fall but the wind and the sun can not easily follow. One such forest was found to have conserved at the close of the season of melting three and one half times as much snow as a very dense forest adjacent to it.

The most efficient type of forest found at levels below 8,000 feet is the fir, whose foliage is much more impervious to the rays of the sun than that of the cedar or pine. At 8,000

feet or higher, the mountain hemlock is most efficient, for not only is its foliage dense, but its tapering spire-like crown offers but little resistance to falling snow.

In the light of the above facts forests may be too dense as well as too thin for the maximum conservation of snow. The ideal forest seems to be one filled with glades whose area bears such proportion to the height of the trees that the wind and the sun can not reach the bottom. These glades can be produced by the forester by judicious pruning and cutting as well as by proper planting. However, the mountain hemlock requires little or no pruning to attain its maximum efficiency.

In the field of hydrology, surveys of snow on the Mount Rose and Lake Tahoe watersheds have been made since the beginning of 1910 to indicate to ranchers and power companies in the basin below the amount of water to expect during the season, and thereby to assure the better control of the reservoirs. This work will be extended to include a study of the behavior of snow on typical slopes during rising temperature and wind with the view of forecasting the probability and extent of floods. For the purpose of offering foresters in the national forests and others the advantage of the investigations in snow a course is now planned at the University of Nevada on the relation of mountains and forests to the conservation of snow, including the improvement of the storage of snow by the planting and pruning of forests to assure the control of stream flow and the increase of irrigation and power resources. Other courses in general meteorology have already been provided.

The staff of the observatory consists of Professor S. P. Fergusson, formerly first assistant at Blue Hill Observatory, who is associate meteorologist, Mr. Arthur L. Smith, observer in Lake Tahoe Basin, and the writer, who is in charge.

Besides annual reports and news bulletins, the more important recent publications are Experiment Station Bulletin No. 79, "The Avoidance and Prevention of Frost in the Fruit Belts of Nevada," and an article on the "Conservation of Snow: Its Dependence on Forests and Mountains," in *Scientific American Supplement,* Vol. LXXIV, No. 1914 (September 7, 1912), pp. 152–55. A bulletin containing an elaborate presentation of the relation of mountains and forests to the conservation of snow is now being prepared.

J. E. Church, Jr.

Reno, Nevada

SPECIAL ARTICLES

THE CULTIVATION OF AN ECTOPARASITIC NEMATODE OF A GUINEA-PIG ON BACTERIOLOGIC MEDIA[1]

On May 6, 1912, while examining a guinea-pig which had died of an unknown cause, it was noted that the skin around and just anterior to the external genitalia was excoriated and covered by a yellowish, cheesy exudate. On examining the exudate under the low power, a large number of actively motile embryonic and adult nematodes were found. On May 7 a second guinea-pig exhibiting a similar, but less extensive, lesion and harboring the same ectoparasitic nematodes was discovered. Lately, a third guinea-pig was encountered, harboring the same nematode not only around the external genitalia, but also on the normal skin of the abdomen and thorax. Careful examination of these and of a number of other guinea-pigs has failed to reveal the presence of the nematode in the gastro-intestinal tract or in any of the internal organs.

A little of the caseous material from the first two guinea-pigs was inoculated onto moist earth and slants of Musgrave's amœba agar and kept at room temperature (about 24° C.). In a few days, a large number of actively motile nematodes were found in these cultures. The amœba agar cultures have, since then, been carried through five subcultures and the worms have also been successfully carried through several subcultures on slants of plain agar and ascites agar. The plain agar and the amœba agar have proved to be the best media, because the accompanying bacterial growth is relatively limited in amount. In several of the above subcultures

[1] A preliminary note, from the laboratory of the Cincinnati Hospital.

the worm has been seen to pass through two complete cycles of development. In one subculture the worms have multiplied and remained actively viable for 23 days, without transplantation.

A striking peculiarity of the growth on the agar cultures is the tendency of the worms to crawl up on the side of the test-tube opposite the slant and there clump themselves into macroscopic groups. Under the low power, these groups are seen to consist of an immense number of very actively motile nematodes in all stages of development.

As yet, we have not determined the exact species of this nematode, but in all probability it belongs to the Anguillulidæ.

N. B.—Since the above was written we have learned from Professor Henry B. Ward of similar cultivation experiments carried out in his laboratory by H. Metcalf.[2]

WADE W. OLIVER

RECENTLY PROPOSED SPECIES OF THE GENUS DICERATHERIUM

SINCE the opening of the Agate Spring fossil quarries in the Miocene formation of Sioux County, Nebraska, by the Carnegie Museum field parties some eight or nine years ago, there has been great activity by many institutions and private parties in this general field. As a consequence much material of fossil remains has been gathered, of which the greater portion, especially in the Agate Spring fossil quarries, consists of bones pertaining to the Rhinocerotidæ.

Pending the publication of a more extended work on the American Diceratheres, now in progress, the purpose of this note is to avoid the recurrence of certain interpretations on the part of students interested in the question of deciduous and permanent teeth.

In recent years there have been a number of new species described of Professor Marsh's genus *Diceratherium* which will be duly considered later. In 1908 Professor Loomis, of Amherst, proposed a number of new forms.[1] One of these (*D. aberrans*, p. 59) is established on a second deciduous cheek-tooth of the left side. Very recently Mr. Harold J. Cook has unfortunately used deciduous teeth as a type of still an additional species *D. loomisi*.[2] The type of this latest species consists of a portion of the right upper maxilla, containing not P^4, M^1 and M^2, as Cook states, but the second, the third and the fourth deciduous cheek-teeth. This is abundantly demonstrated in the large collection from the Agate Spring fossil quarries now under study in the Carnegie Museum.

In this connection it is well to state that the formation of the permanent premolars 2, 3, 4 of *Diceratherium* starts comparatively late. I have excavated maxillæ (Nos. 2464, 2476, Carnegie Museum) of young specimens and often find that while the deciduous 2, 3 and 4 are considerably worn the germ of P^2, which is located immediately above the roots of D^2, is only very slightly and more often not at all indicated. At the same time P^1, which is erupted in an early stage, is on an even grinding plane with the milk teeth and has received considerable wear; more than half of the grinding surface of M^1 appears through the alveolar border, while M^2 is represented by a large excavation immediately back of M^2. In comparing Mr. Cook's figures (*l. c.*, p. 31) I judge that he has described a young specimen of *D. cooki* in the stage of development described above. In a later stage of development (specimen No. 1848) the formation of the permanent premolars is well advanced, especially in 2 and 3. M^1 is completely erupted, M^2 appears in a large triangular opening of the alveolar border, while M^3 is represented by a similar excavation to that of Nos. 2464 and 2476 above described. Thus it is repeatedly demonstrated that a large collection of a genus or species is extremely useful as a safeguard against the misinterpretations of which the systematists are surrounded.

O. A. PETERSON

[1] *American Journal of Science*, Vol. XXVI., pp. 51–64, 1908.

[2] Nebraska Geological Survey, Vol. VII., Part 4, pp. 29–32.

[2] "Cultural Studies of a Nematode Associated with Plant Decay," *Trans. Amer. Microscop. Soc.*, 1903, 24, p. 89.

SOCIETIES AND ACADEMIES

THE ACADEMY OF SCIENCE OF ST. LOUIS

THE first meeting of the season was held at the Academy Building on Monday evening, October 21, 1912; President Engler in the chair.

Dr. G. O. James, of Washington University, addressed the academy "On the Contingence of the Physical Theory and the Problem of the Geologic Past."

After reviewing the theories of Helmholtz, Mach and Enriques on the principle of causality, Dr. James stated that as far as descriptive representation of the present is concerned, it makes no difference whether or not we admit that pushing the precision of measurement further and further we shall ultimately come to a point where there ceases to be accord between observation and theory, and beyond which it can not be again established.

The postulate of causality builds the program according to which we must envisage the geologic past and prescribes the confines within which expectation places the future. Without it neither would exist for us. In answer to whether a past or future created in accordance with the postulate of causality possesses reality, it was pointed out that the older point of view, which regarded empirical verification as a proof of reality, which nevertheless did not cease to exist even when all connection between the external world and its representation was broken, has given way to a modern conception of reality of which invariance is the criterion, but regards this invariance as relative and approximate.

Dr. James also read an appreciation of the life and work of Jules Henri Poincaré, who died July 17.

THE academy met on Monday evening, November 4, 1912; President Engler in the chair.

Professor Nipher, of Washington University, gave a verbal account of work supplemental to that published in his last paper.[1] This work has reference to the longitudinal creeping of a copper wire through which spark discharges are passed.

In his latest work the wire is laid upon a strip of plate glass having a length of 71 cm.

The wire extends several centimeters beyond the glass and the ends drop downwards about 8 or 10 centimeters. The discharges are sent into the side of the wire from above, and just outside of the glass support. Small brass cylinders are placed between the wire and glass at the ends in order to eliminate frictional contact at the edge of the glass. The main portion of the wire rests upon the glass. A condenser formed of tinfoil and sheets of glass having the dimensions 26×26 inches was used. The total area of tinfoil in the condenser was 2×15 square feet.

The recent results were obtained when one of the discharge terminals was grounded. When the positive terminal is grounded a compression wave is sent surging through the wire, and the wire is driven in the direction of the corpuscular displacement thus impressed upon the nebulous corpuscular column within the wire.

When the negative terminal is grounded, a rarefaction wave is sent through the wire in the opposite direction. The displacement is in the same direction as before. The air-gap between the positive terminal and the wire is then first converted into a drainage or conduction channel, and the discharge from the wire is drained into it. The wire now creeps in a direction opposite to that of the corpuscular displacement. In one case an aluminum wire was made to creep over a distance of 18 cm. by the passage of about 1,200 sparks.

When neither terminal is grounded the wire also creeps in the same direction as when the negative terminal is grounded. The surging effect of the compression wave is then eliminated. This is the condition discussed in Professor Nipher's paper forming No. 3 of Vol. XXI. of *The Transactions* of the academy, to which reference is made in SCIENCE, August 2, p. 153.

When a short wire 4 or 5 cm. in length is placed upon the glass plate, two or three cm. from the creeping wire, it creeps in the direction in which it is urged by the surging wave which is induced in it. The direction is the same whether the wave in the primary wire is one of compression or of rarefaction, or whether both are simultaneously imposed. The short wire is placed opposite the middle of the primary wire.

All of these creeping effects are reversed in direction, when the direction of discharge through the main wire is reversed.

Mr. M. E. Hard also gave a brief talk on "Mushrooms found in the Vicinity of St. Louis."

GEORGE T. MOORE,
Corresponding Secretary

[1] *Trans. Acad. of Sc. of St. Louis*, Vol. XXI., No. 3.